

Northstar 972

Quickstart Guide and Reference Manual

Revision B

Attention Installers:

This processor module must be handled with reasonable care and protected from the following;

- Moisture: Do not mount this processor in unprotected areas of the vessel having moisture.
- Vibration and shock: Use of the supplied shock/vibration mount is a mandatory part of the installation. Only mount this unit in a horizontal position with adequate space for ventilation, maintenance and for field service removal. Rough handling during removal or installation can cause premature failure of internal components.
- Radar interference: Do not install the processor or cabling in areas exposed to interference from any radar. The processor should be mounted as far as possible below any source of radar interference.

Flybridge installations of the processor are not recommended and should be avoided. Installations in these areas require special provisions for shielding and the installation design must provide total protection from any moisture.

Problems caused by moisture, vibration and radar interference are not covered by warranty. Refer to the installation manual P/N GM972IM for additional installation, troubleshooting and warranty information.

For advice regarding equipment placement, please consult with an authorized Northstar Servicing Dealer before beginning the installation.

To locate a Northstar Servicing Dealer near you call 978-897-6600

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This chapter introduces this manual and explains a few things you should know to keep your Northstar 972 in top operating condition.

Welcome to the Northstar 972

The 972 has several requirements that must be met to ensure safe and proper operation. Installation and interfacing of the 972 should be handled by a marine technician using the guidelines found in the Northstar 972 Installation Manual.

Congratulations on your purchase of the Northstar 972 Integrated Navigation System! The 972 is a full-featured 3D color GPS/vector charting system – easy to use, but meeting your marine navigation needs in a comprehensive, logical manner. Optional Northstar radar and fish finding modules round out the 972's capabilities.

The 972 enhances GPS with the Wide Area Augmentation System (WAAS) for superb accuracy, and offers a high-resolution full-color screen with Jeppesen Marine and BSB cartography.

Major functions are accessed with a single keypress. By reducing the attention required to navigate, you can devote more time to simply enjoying your trip.

For information on installing, interfacing, and troubleshooting the 972, please see the *Northstar 972 Installation Manual* (part number GM972IM) or contact your local authorized Northstar dealer.

Using this manual

This manual is divided into two main sections:


- The Quickstart Guide begins on page 9 and has all the basic information you need to operate the 972. Be sure to read this section as you start using the unit.
- A Reference Section starts on page 27. Use this when you need more information about any of the unit's functions – you'll find answers here to any questions about getting the most from your 972.

Check the mini table of contents at the beginning of each chapter to quickly locate a topic you need help with.

It's best to read this manual with the 972 set up and running so you can try out the various functions and see the results.

Conventions

This manual uses certain conventions to provide a consistent means of recognizing specific information, as follows:

-  is the universal caution symbol for caution and warning information related to your personal safety or possible damage to the system. The **CAUTION** and **WARNING** notes contain critical information—please read them!
- The phrase “Press a key” means push briefly and release, unless otherwise specified. “Press and Hold” means to hold the key until the desired result occurs.
- Text written like “**CHART**” generally refers to named keys on the 972’s front panel.
- Text written like “**More info**” generally refers to the 972’s menu keys at the right side of the screen.
- Whenever this manual tells you to press **ENTER** to perform a function, you can press **CLEAR** instead if you decide not to perform that function. These keys are abbreviated **ENT** and **CLR** on the 972.

Networking the 972

Northstar’s networking technology lets you connect two or more 972 units in order to share navigation data (including radar and sounder data) and all waypoints and routes between the units. The system can be operated from any connected unit, and all changes to routes and waypoints are reflected on all the networked units. Networking is fully automatic on the 972 – no special steps are necessary

One display unit is designated as the master, and all others as slaves. The only restrictions on networking are the following:

- there must be one and only one master unit operating in a network

- all units must have the same software version.

If, for example, a slave unit is turned on before the master, a message is displayed reminding you to turn on the master unit before using the slave. In case the master unit is not available (removed for service, for example), brief instructions show how to temporarily convert a slave into a master unit.

For details on networking, see *Networking* starting on page 141.

Interfacing the 972

The 972 can be connected to a wide variety of compatible marine devices, including Northstar's echo sounder and radar. A qualified marine electronics tech-

nician should perform these installations. For details, contact your local authorized Northstar dealer.

Maintaining the 972

Basic maintenance

To help retain the 972's best possible performance, Northstar recommends the following:

- keep fingerprints off the display screen (remove any prints with a lens cleaning cloth)
- remove dirt and grime using a soft cloth and Windex or soap and water
- don't scratch the display by wiping a sandy or salty cloth across it
- use the 972's protective plastic sunshield when not in use (excessive heat from the sun can cause damage)
- don't open the 972 case—there aren't any user-serviceable parts inside
- always keep the rear connectors' plastic caps on when they are not in use (the connectors are not waterproof unless covered)

Pre-packaged moist towellettes (especially those containing a small amount of alcohol) are excellent for cleaning the display window. You might want to keep a supply on hand to wipe off fingerprints and other smudges.

Cleaning the display screen

Be careful when cleaning the glass window covering the display screen. Although the window is scratch-resistant, you may damage the anti-reflective coating if you use a dry cloth to wipe dirt off. Always use a damp cloth with plenty of water to remove salt or dirt. To remove any oil or grease on the screen, use a clean, dry microfiber-type lens cleaning cloth or a small amount of window cleaner.

Avoid touching the window with your fingers. The natural oils from your hand will temporarily affect the characteristics of the screen and cause your fingerprints to appear as bright reflections. Fingerprints will disappear when you clean the screen as described in the previous paragraph.

Technical support

Northstar products are manufactured and serviced by BNT Marine Electronics.

If you need technical support, or have any other questions after you've followed the instructions in this manual, you can contact the factory as follows:

by Telephone:

978/897-6600 or 800/628-4487

by E-mail:

Service: service@bntmarine.com

Sales: sales@bntmarine.com

by Fax:

Service: 978/897-1595

Sales: 978/897-7241

by U.S. mail:

Northstar

30 Sudbury Road

Acton, MA 01720 USA

Additional information is available at Northstar's website:

www.NorthstarNav.com

Hearing from you

Your feedback is important and helps ensure that this manual is a valuable resource for all 972 users. Send your questions, comments, or suggestions about this manual to:

manuals@bntmarine.com

Service and repair

In case of a 972 operating problem, check all interconnecting cables and fuses. If you continue to have problems, contact your dealer or the factory for additional assistance. If required, you can return the 972 to the factory for diagnosis and repair. When calling, be sure to have your 972 serial number and software revision available. In describing a problem, be as complete and accurate as possible. Before returning the 972 for repair, you may want to save your waypoints and routes. If the unit is properly networked to another 972 display, a copy of your waypoints and routes is already saved in the other unit. You can also transfer data to a Northstar 6000 series or older navigator or to a PC as described on pages 80 and 83.

NOTE:

To prevent delays, it's critical that you first obtain a Return Materials Authorization (RMA) number from our Service Department before returning your 972.

Shipments to BNT Marine Electronics should be made to the following address:

Northstar Service Department
30 Sudbury Road
Acton, MA 01720

If you have special overnight or second-day shipping requirements, please call for turnaround time and freight costs before you ship your 972.

Electronic Charts and the 972

One of the 972's unique features is the ability to display both raster and vector charts. In split screen mode, you can even display a raster chart and a vector chart side by side. This is a great way to understand the differences and similarities between the two.

Raster Charts

Raster charts are literally digital scans of paper charts. In most cases, these paper charts are issued by the local government. The scans, like digital photos, are a matrix of dots. The challenge in raster charts – the earth is round (3D) and the chart is flat (2D) – is to be able to determine the precise latitude and longitude of each dot at any zoom level.

One of the biggest benefits of raster charts is their appearance – it is identical to the

paper charts. It's like having the paper chart on the screen.

This is also one of the drawbacks to raster charts. Since the chart is just a matrix of dots, the chart plotter cannot tell the difference between a navaid and a depth sounding. Furthermore, they really only look great at one particular zoom level. Zooming in or out from that level compromises display quality.

Vector Charts

Vector charts, on the other hand, are drawn on the screen from a set of rules specific to each chart – instead of a digitized photo of the chart, it's a mathematical description of the chart. The chart plotter interprets the description and then draws (renders) the chart. Whatever the screen resolution or zoom level, they always look great. Rather than being a

matrix of dots, the vector chart is a series of lines and shapes. The shapes are then filled in with colors.

One of the biggest benefits of vector charts is that nav aids and other points of interest are specified in the chart data, so the plotter can highlight nav aids, and do intelligent things when the vessel or the cursor gets near a nav aid. This increased flexibility is virtually boundless in the power it offers.

Another advantage is the ability to “layer” the data. The user can shut off certain layers so the display is less cluttered.

One of the drawbacks of vector charts has been that they don’t look identical to the raster charts. With advances in technologies – both in cartography and marine electronics – this disadvantage is disappearing.

See page 28 for more on charts in the 972.

Purchasing charts

Where to purchase Passport Charts

You may purchase charts by
telephone at:

800 272 6205

or online at

www.PassportOnBoard.com

Purchasing charts for your 972 is quick and easy, because all available charts are already stored on a hard disk drive in its processor module. There’s no waiting for delivery or visits to dealers – you only need to purchase a chart permit to use them.

To purchase additional charts:

1. Press the **STAR** key several times to display the *Passport OnBoard* screen.
2. Note the Passport OnBoard serial number, and contact Jeppesen Marine by telephone or the Internet to purchase the chart permits you need.
3. Enter the chart permit and press **ENTER**.
4. Wait for the chart to be activated (up to five minutes).

In addition, a menu key for purchasing charts is displayed on the chart screen, whenever there are additional charts that you have not purchased, at the current vessel position.

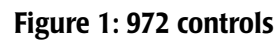


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This section gives an overview of each of the 972 major functions and the basic information you need to begin using them.

We suggest you read this section carefully as you first use the 972 and then refer to the following Reference Sections, as necessary, to answer any questions you may have.



Turning the 972 on and off

CAUTION!



Use caution when navigating with electronic charts. Although every effort has been made to ensure that the data the 972 uses is as close as possible to paper charts, errors and omissions are inevitable. The captain is responsible for cross-checking the 972 against other sources of navigation data.

Turning the 972 on

To turn the 972 on, gently and briefly press the **PWR** key. (See Figure 1 on page 10 for a picture of the controls.)

During the startup sequence, the 972 beeps and displays its start-up screen, and then performs a series of self-tests to check its critical components and functions. Any startup issues are indicated by a double asterisk on the screen.

Next, a message warns against relying on the 972 chart cartography as the only means of safe navigation. Acknowledge the

warning message by pressing the **CHART** key.

Now you're ready to get underway with your 972!

If this 972 was recently used at or near its present location, it will usually be ready to navigate within one minute after it is turned on.

Turning the 972 off

To turn the 972 off, press and hold the **PWR** key until the screen goes dark. Allow up to 30 seconds for the black box to power down.

Introducing the display screen

Adjusting the brightness

To adjust the screen's brightness press the **BRT** or **DIM** key.

If the 972 becomes too hot due to high ambient temperature and strong sunlight, the display screen may automatically dim to prevent overheating. You can temporarily override the auto-dim function at any time just by increasing the brightness.

The 972 may dim again to avoid exceeding the maximum internal temperature.

Special display windows

Occasionally, the 972 needs to tell you something or ask permission to do something. When this happens, an information or question window appears on the screen. This window may contain an alarm icon, or

an *INFO* icon or a large question mark along with a message for you to read.

For more on alarms, see "Displaying alarm messages" starting on page 132.

Question windows

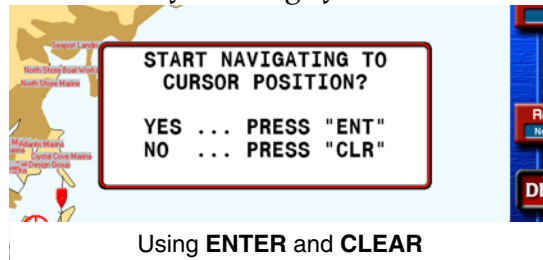
A question window appears when the 972 needs a



response from you. Respond to a question window by pressing the **ENTER** key to answer yes, or the **CLEAR** key to answer no. Most of the other keys, including the function keys, are temporarily inactive while the 972 displays a question window.

Introducing the controls

Feel free to try any of the 972's controls! You can't hurt anything, and you'll only learn more about how to use the 972 more efficiently. The 972 always asks you to verify what you're doing before it changes or deletes information. You'll be asked to confirm your action *before* anything happens that may affect the 972's operation. You can always press **CLEAR** to cancel a function if you change your mind.



Function keys

Figure 1 on page 10 illustrates the locations of the 972's controls.

The seven keys below the screen access the unit's major functions. These are **CHART**, **POSITION**, **STEER** and **3D**, and the optional functions **RADAR**, **SOUNDER** and **VIDEO**. Press one at any time to instantly display that function on the full screen, then use the menu keys at the right edge of the screen to control the function.

The **WAYPTS/ROUTES** key accesses the 972's database of stored position information.

The **STAR** key accesses the alarm screen and miscellaneous functions including TideTrack and setup commands.

Split screen feature

Press the **SPLIT** key to split the screen into two or more sections, each with a different function displayed. See page 23 for more information.

Menu keys

The six round keys at the right of the screen take on different functions, depending on the screen displayed. Each active key is labeled on the screen.

You can press **CLEAR** to hide the labels and display more data on the *Chart*, *3D*, *Split*, *Sounder* and *Video* screens. To show the labels again, press any menu key. On the *Chart* screen, you can also hide the info bar (see *Displaying numeric data on the chart screen*, on page 19) by pressing **CLEAR** a second time, while the menu keys are hidden.

Setting options

Installation and setup options are available by pressing the **STAR** key several times to display the *Options/Service Info* screen. This is where you set options for system settings such as Service Options, Port Setup, Software Update, etc.

Function options

Begin on the screen whose options you want to change. Then **press and hold that function key for about a second**. A screen showing the options for that function will be displayed.

Use the cursor pad to select an item, press **Edit**, press the cursor pad to choose the desired setting, and then press **ENTER**. Any settings you change will apply to the entire system, not just the function in use.

Detailed chart data

You can purchase chart permits for any area in the world directly from Jeppesen Marine. Visit www.PassportOnBoard.com for details on the simple procedure and to obtain the permits. Or, see your marine dealer.

All available charts are already stored within your 972, and you can activate chart, current and tide data at any time by simply obtaining and entering a permit code.

World Folio out of date warnings

When the world folio on your system reaches 13 months old, you will see a warning reminding you to update it.

Safe mariners always use up-to-date charts and information.

Displaying available charts

Press the **STAR** key repeatedly until the *Passport OnBoard* screen appears. On this screen, you can see the activated chart regions and enter additional chart permits.



Chart Setup/status screen

Displaying the chart screen

After the 972 completes its start-up sequence, press the **CHART** function key to acknowledge the warning message and display the *Chart* screen.

You'll see your present position represented by a red vessel symbol in the center of the chart. If you're not receiving GPS signals, you can use Demo Mode, as described on page 19.

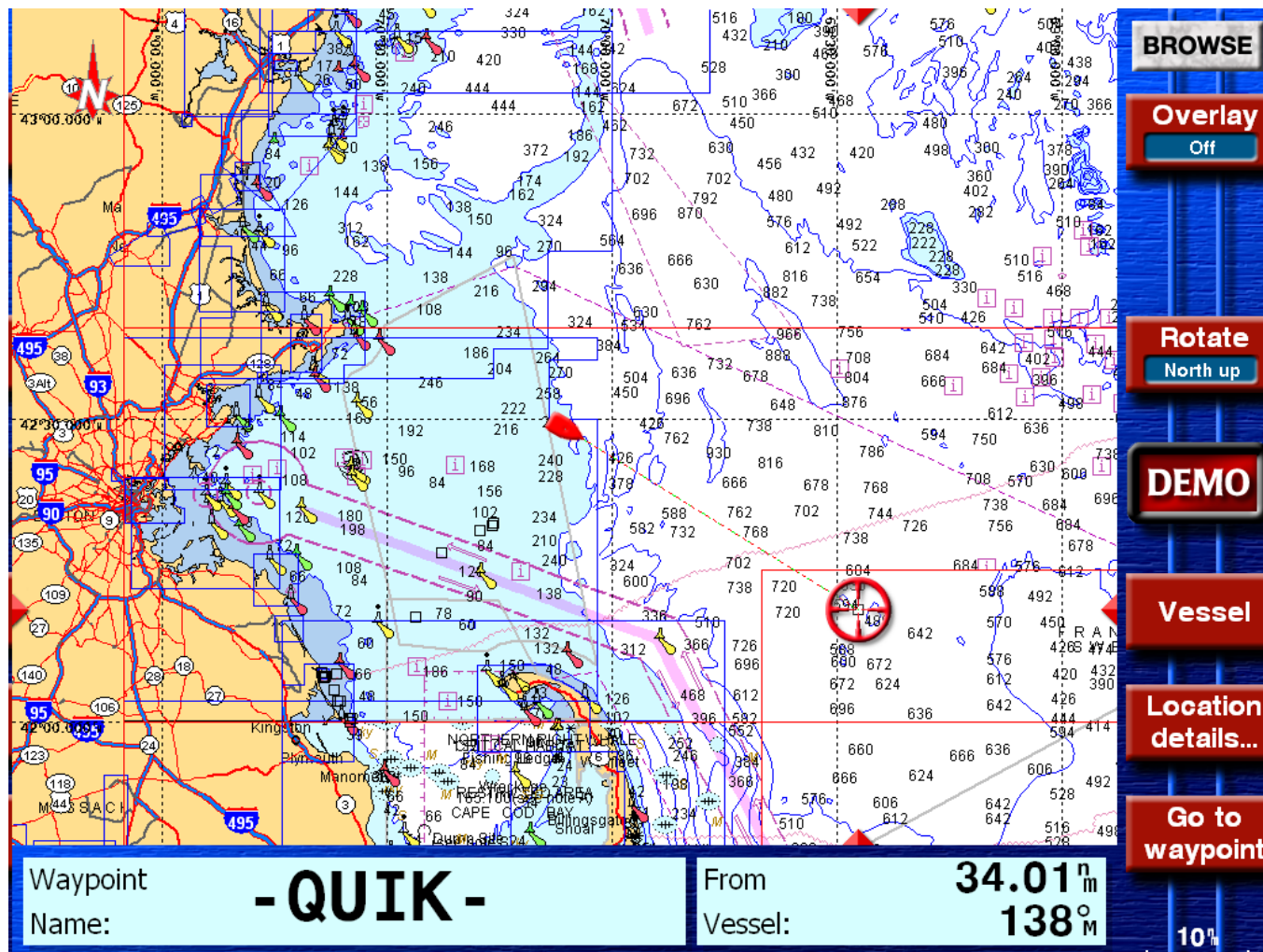


Chart screen

The 972's *Chart* screen displays your vessel's present position (or any position you designate with the cursor pad) in relation to land masses, nav aids, and any waypoints and routes you have entered. As you navigate, your vessel remains stationary on the *Chart* screen, and the chart moves underneath your vessel.

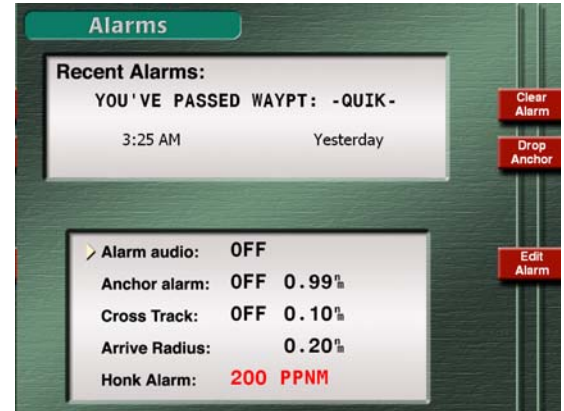
Clearing a GPS or WAAS alarm

If the 972 isn't able to obtain a position from GPS within three minutes, you'll see a flashing **NO GPS** alarm icon on the right side of the screen. This means the 972 has an alarm message that needs your acknowledgement: Press the **STAR** function key to display the *Alarms* screen.



The alarm message NO GPS POSITION FIX is shown in the Recent Alarms box. This message advises you that the 972 is still in the process of acquiring satellite information necessary for displaying a position fix.

The word **NEW** in the upper right corner of the screen tells you this message hasn't yet been acknowledged. To acknowledge this or any message alarm, press the **Clear alarm** menu key. As soon as the 972 acquires its signals, you'll be ready to go.



Alarms screen

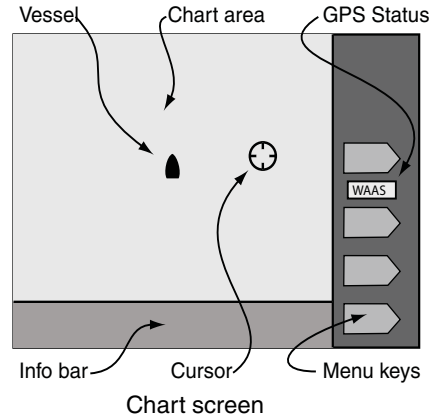
For details about alarms, see *Alarms*, starting on page 132.

Using the chart

Your vessel is normally shown in the center of the chart screen. If your vessel is moving, the symbol will point in the direction of your Course Over Ground (COG). (If your vessel isn't moving, the 972 can't determine your COG, so the direction of the vessel symbol won't mean anything.)

To zoom in and see more details about your position, press the **IN** key. To zoom out (more area and less detail), press **OUT**.

Press the cursor pad to display the red cursor and designate waypoints or move the chart to a different area. Press **Vessel** to recenter the chart on your vessel.



The GPS status is shown on the right side of the screen:

- **GPS** – navigating with normal GPS signals
- **WAAS** – navigation enhanced with high-accuracy WAAS signals.
- **DEMO** – running in simulation mode

Chart plotter functions

The menu keys at the right of the chart screen perform the following navigation functions (not all keys are shown all the time):

- display any available overlays, such as radar
- rotate the chart to north-up, course-up, leg-up or heading-up (heading-up requires an optional heading sensor)
- return from “Browse” mode (cursor on-screen) to “Vessel” mode (vessel centered)
- show detailed information about the displayed chart
- display additional position information in the *Info bar* at the bottom of the screen
- go to a waypoint, nav aid, or unmarked point you select on the chart screen by pressing the cursor pad

Displaying other information

On the *Chart* screen, you can display your current route, track history, waypoints and avoidance points, a lat/lon grid, a radar overlay, or other chart details. See *Setting up the chart screen*, on page 33.

Chart options

Once on the *Chart* screen, Press and hold the **CHART** key to display options for the *Chart* screen. See page 33 for the other options.

Press **Chart Detail** to select the items to be displayed on the chart screen.

3D chart screens

The Northstar 972 can also display three-dimensional images of the ocean bottom and land areas. Press the **3D** key to display these images.

Use the cursor pad to position the camera viewpoint.

A red line drops from the vessel to the seabed to show the water depth visually.

Menu keys:

- **Overlay** – applies a vector-based chart to the 3D image (this operation may take quite a bit of time the first time a chart is accessed)

- **Browse** – allows the viewpoint to be moved by using the cursor pad
- **Bottom Lock** – Locks the camera to the seabed directly under the vessel, instead of the vessel itself
- **Camera up** – in Browse mode, moves the camera viewpoint higher
- **Camera down** – in Browse mode, moves the camera viewpoint lower
- **More info** – steps through the available info bars at the bottom of the screen
-

Alarms

The Northstar 972 alerts you to conditions that may require attention. Some alerts are strictly informative, such as nearing a waypoint, and some warn of conditions

such as loss of navigation signals. The unit alerts you with a beeping sound and a flashing symbol at the right edge of the screen. Many alarms automatically clear

themselves after a few seconds. Others remain flashing until you press a key on the *Alarm* screen or until the condition

clears. See *Alarms*, starting on page 132 for a listing of all alarms and the meaning of each.

Using demo mode

You can use demo mode to simulate a stationary position, or simulate navigating to a location you select on the *Chart* screen. Demo mode is useful for training, and could be used for dead reckoning in the event that GPS signals should ever fail.

To access the demo control screen, display the *Chart* screen and press and hold **CHART** to display the chart options. Then press **Demo control**.

To place your vessel at a simulated position and enter demo mode, press the cursor pad to move the cursor to the desired position on the chart. Zoom out if you need to see more area. Press **Demo Position** and then **ENTER**. Your vessel symbol will now be stationary at this position.

To simulate motion from this point to another location, press the cursor pad to move the cursor to the destination, then press the **Demo COG/SOG** key. To change the vessel's speed from the standard 10 knots, use the keypad to enter the new speed. Finally, press **ENTER** to start moving to the demo cursor location.

To view the *Chart* screen while in demo mode, press **Return** twice.

The word Demo always appears on the right side of the Chart screen when you're in demo mode.

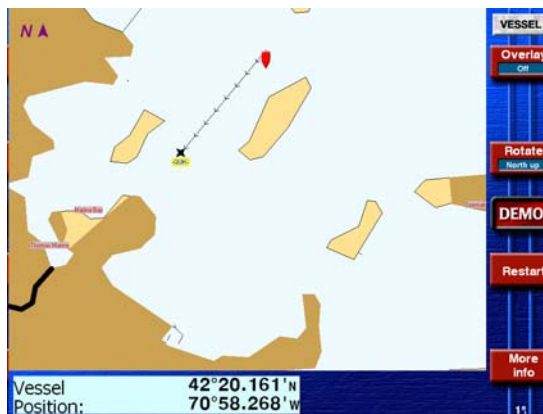
To leave demo mode, go back to the *Demo control* screen as described above, and press **Exit Demo**.

This key returns you directly to the active Chart screen.

Displaying numeric data on the chart screen

To display numeric information directly on the chart screen, press the **More Info** menu key to display an "info bar" at the bottom

of the screen. (If the **More Info** key is not visible, press **Vessel** to restore it.)



Vessel lat/lon displayed on chart screen

- your vessel's distance (*Dist*) and bearing (*Brg*) to the current waypoint, if any, along with a cross-track indicator
- your vessel's position in lat/lon (or TDs, if you've enabled loran)
- tide and current information at the nearest tide station

Each additional press of the **More Info** key shows the following information:

- your vessel's present Speed-Over-Ground (*SOG*), Course-Over-Ground (*COG*), heading (*HDG*) (if a heading sensor is connected)

Displaying numeric data on the position screen

To display your position, speed, course, and time with large, easily read digits, press **POSITION**. The *GPS Position* screen shows the following information:

- your vessel's position in lat/lon (or Phantom loran TDs, if enabled)
- your vessel's present *SOG* and *COG*

- current time, day, and date
- geodetic datum (for details, see *Choosing a geodetic datum*, starting on page 149)

Press **POSITION** a second time to see Phantom loran TDs See *Using Phantom Loran*, on page 49.

Press and hold **POSITION** to display options for this screen (see *Position screen options*, on page 47).

For details about using this screen, see *Position coordinates*, starting on page 45.



GPS position screen

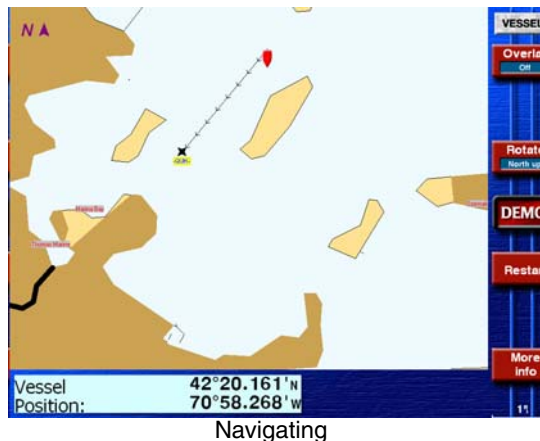
Going immediately to a quick waypoint

The Northstar 972 can guide you directly to any point on the chart screen that you designate. "Point-and-shoot" navigation, as it is called, is often the easiest way to go to a waypoint or a series of waypoints: Just select the points right on the chart and go to them, one after another. This technique provides the most flexibility in deciding where you want to travel. Simply move the cursor wherever you want, press a key, and you're navigating.

1. Press the **CHART** key to display the *Chart* screen.
2. Press the cursor pad to move the cursor to the desired spot on the chart.

3. Press **Go to cursor**.
4. Press **ENTER**.

The 972 displays a track line to the new waypoint named -QUIK-, and guides you directly to this point.



Watch your progress on the chart screen, or press **STEER** to stay accurately on the straight-line course to the waypoint (see *Steering to a waypoint*, starting on page 54).

That's all you have to do to use the 972 in its simplest form. To learn more about navigating to waypoints, See *Navigating to Waypoints*, starting on page 51.

Radar

Using the optional Northstar radar you can determine where other boats or ships, navigational markers, land masses, flocks of birds, and other objects are located in relation to your vessel, and you can track their movements.

The radar won't be operational until you turn on the radar transmitter. See *Displaying radar*, starting on page 87.

If a Northstar radar unit is interfaced to the 972, press **RADAR** to see the radar image.

Press **Adjust Radar...** to make operating adjustments to the radar system as

described in *Using the Adjustment keys*, starting on page 91.

Press **Adjust Markers...** to set the radar's Electronic Bearing Lines, Range Rings, etc. as described in *Using the Markers keys*, starting on page 94.

On the *Chart* screen, you can press **Radar overlay** to superimpose the radar image on the chart screen. More information on radar starts on page 85. You can also designate and track MARPA targets with the Northstar 972.

For information on installing radar and making it operational, see the *Northstar*

Radar Installation Manual (part number GMEKRADIM).

The echo sounder

If your 972 is equipped with Northstar's optional echo sounder, press **SOUNDER** to display the full *Echo Sounder* screen.

For the simplest operation, press **Auto**, and select the desired transducer frequency and zoom modes. More information about sounder setup and operation starts on page 103.

Split function

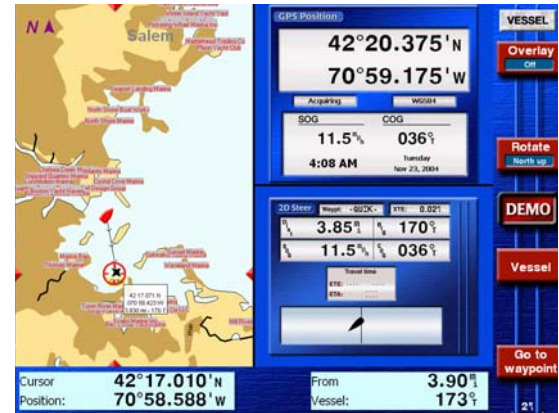
The SPLIT key

You can *split* the screen to display several navigation functions on the screen at the same time. For example, you could display the chart, sounder and radar images simultaneously, or even two chart screens.

A chart screen is always shown on the left side, and you can choose one or two other functions to be displayed on the right side.

Press the **SPLIT** key to split the screen into two or three sections, each with a different function displayed. Press **SPLIT** a second time to configure the combination of functions to be displayed.

For two simultaneous functions, just press **Right** to step through the options.



Split screen with Chart, Position and Steer

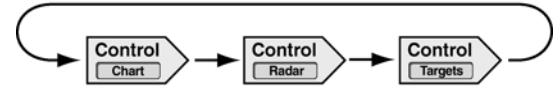
For three simultaneous functions, press **3-way split**. Then press **Top** to step through

the available screens for the top right function. Press **Bottom** to step through the same choices for the bottom right function.

The Control key

When the screen is split to show more than one function, you can press **Control** to

select which of the displayed functions is controlled by the menu keys. For example:



The **Control** key is also available when the radar overlay is in use.

The STAR key: alarms, TideTrack and setup

Using the alarms

The 972 has several alarms that automatically alert you to certain situations. For example, the 972 lets you know when you're approaching a waypoint by sounding a beep and flashing an alarm icon on the screen. The icon explains the reason for the alarm. Most of the common alarms automatically cancel themselves after ten seconds or after the condition ends. For details, see *Alarms*, starting on page 132.

Using TideTrack™

Press the **STAR** key repeatedly until you see the 972's *Tide Track* screen, a 24-hour tide graph for any of over 3,000 NOAA tide stations covering the entire U.S. coastline,

including Alaska and Hawaii, plus much of the eastern and western Canadian coastline. You can display tides for today or any other date. For details about TideTrack, see *TideTrack™*, starting on page 137.

Press **STAR** again to display currents in the same manner.

Tide and current data are available for chart regions that have been activated for use.

Setup functions

Additional presses of the **STAR** key access the 972's various setup and customization functions. These functions are described beginning on page 146.

SAVE and Man Overboard (MOB)

Pressing **SAVE/MOB** always saves your present position as a waypoint.

Saving waypoints

Press **SAVE** briefly to save a waypoint. The new waypoint is given a name such as **-S002-**, where the letter **S** indicates a saved waypoint, and the three-digit number increases by one every time you save a waypoint.

You can limit the number of saved waypoints that will be stored. Use the *Max Saved waypoints* function in the *Navigation Options* menu (see *The maximum number of saved waypoints*, on page 148).

When the three-digit number reaches the specified maximum, it wraps back to **001** and overwrites the older waypoint that has the same number.

Any saved waypoints that you want to keep or use in a route should be renamed before they are overwritten (see *Editing waypoints*, starting on page 69).

Saving routes

You can set the 972 to automatically save a sequence of waypoints as a route. Each

time you press **SAVE**, your position will be recorded as an additional waypoint in the route. See *Saving a route as you travel*, starting on page 74 for details.

Man Overboard

Press and hold the **SAVE/MOB** for at least four seconds (until you see the “Man Overboard” window) to save your position as a waypoint named **-MOB-**. The 972 immediately and automatically does the following:

- switches to a zoomed-in chart screen showing your vessel and the MOB waypoint
- enables the wake line
- switches to vessel mode
- starts navigating to the MOB point

You can use any of the unit’s functions to return to the location of the waypoint. The 972 never shows the “Arrive” indication – it continues guiding you to the MOB waypoint until you instruct it otherwise.

When you’re finished using the MOB function, just continue using the 972 in whatever way you wish.

1

Reference section 1

Using the Chart Screen

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This section explains the electronic chart, the two chart modes (Vessel and Browse), the various chart symbols and their meanings, and how to set up the chart display to operate the way you want it to be.

Using electronic charts

CAUTION!



Nav aids have been converted from official paper charts into the electronic format on your screen, and therefore aren't necessarily as accurate as the paper charts. In some areas, only the most important nav aids may be shown.

Electronic charts contain most of the information from the original paper charts. You can select which categories of data are displayed to simplify the screen. When used with caution, electronic charts open up a world of navigational accuracy and simplicity.

Chart boundaries

The 972 displays the boundary line of each chart on the *Chart* screen. You can turn these lines off if you prefer (see *Choosing vector chart details*, starting on page 35).

If you move from a highly detailed chart to a less detailed one, you may see a sudden change in the detail shown on the screen, just as if you had changed from one detailed paper chart to a less detailed one. The displayed boundary lines may help

indicate when this change in detail is going to happen.

Lights and buoys

The nav aids on the *Chart* screen represent a variety of standard “aids to navigation” used on coastal and inland waterways throughout the United States. Most of these aids are buoys, lights, lighthouses, and daybeacons, which typically are maintained by the U.S. Coast Guard. Nav aids warn you of hidden dangers, such as underwater hazards, and to help you safely navigate specific waterways and channels.

On a vector chart, when you move the cursor over a nav aid, with popups are turned on, the 972 displays a description in the popup rectangle near the nav aid, along with the distance and bearing from your vessel to the nav aid.

Zooming in and out

To get a closer look at the chart area around your vessel or around the cursor, press the **IN** key to zoom in. To see a wider area, press **OUT** to zoom out. Each press of **IN** or **OUT** approximately halves or doubles the chart scale.

NOTE:

Whenever the radar overlay is turned on and “Auto Range” is turned on, the scales of the chart and the radar are locked together so that the images will line up. If you change the scale of one, the scale of the other changes automatically.

Using the cursor on the chart screen

Pressing the cursor pad displays the red cursor symbol on the *Chart* screen. Further pressing of the cursor pad moves the cursor across the screen.



If you have trouble finding the cursor in a busy part of the Chart screen, just look at the edges of the screen for the red cursor pointers: They line up with the cursor.

When you press the cursor pad, the 972 goes into *browse mode*, described on page 29.

If you move the cursor on top of a waypoint or navaid, you will *select* that point. Information about the selected point appears in the popup rectangle.

After pressing the cursor pad to move the cursor to a point on the chart, you can

press **Go to cursor** and **ENTER** to start navigating to the designated cursor location.

*If you placed the cursor on a waypoint, this menu key would read **Go to waypt**.*

You can use the cursor to:

- select a nav aid or waypoint, to:
 - > show its name, lat/lon, and distance and bearing
 - > navigate to it
 - > add it to a route
- designate a point on the chart, to:
 - > show its lat/lon
 - > navigate to it
 - > add it to a route
 - > store as a waypoint
- select a leg of a route to follow or edit
- view a new area of the chart by moving the cursor to the edge of the screen

Comparing vessel and browse modes

The 972 offers two display modes:

- vessel (your vessel is centered on the screen)
- browse (a cursor is displayed, which you can move to designate points or explore other areas of the chart)

To switch from vessel mode to browse mode, press the cursor pad. To switch back to vessel mode, press the **Vessel** menu key.

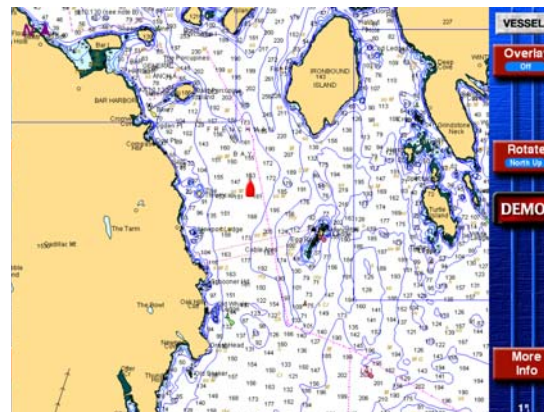
Vessel mode

The word *VESSEL* in the upper right corner of the screen means you are currently using Vessel mode.

Vessel mode is the primary screen for navigating – the chart moves automatically under your vessel, which remains stationary on the screen. It provides a continuous view of your surroundings.

Press **More info** to display your position coordinates in the info bar at the bottom of the screen. You can also display your SOG and COG, or distance and bearing to the current waypoint (if any), or the nearest tide and current station.

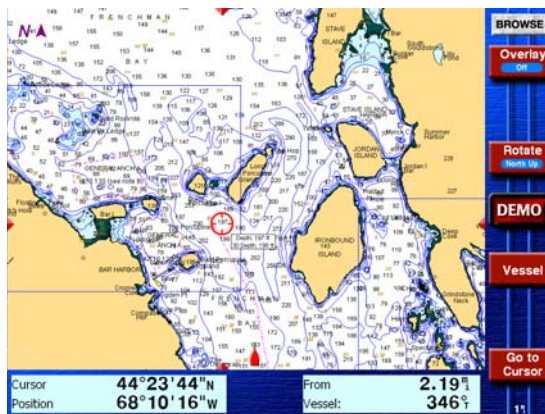
When your vessel's position moves to the edge of a chart, its icon may move from the center of the screen.



Vessel mode

Browse mode

The word *BROWSE* in the upper right corner of the screen means you are currently using Browse mode.



Browse mode

The info bar at the bottom of the screen displays the position coordinates of the cursor, and the distance and bearing from your vessel to the cursor.

In browse mode, you can use the cursor to look at other areas of the chart, and designate points you want to navigate to.

Rotating the chart

Press the **Rotate** key to change the angle of the charts displayed on the *Chart* screen. As long as you're in vessel mode, you can rotate the chart to any of the following angles:

- North-up – No rotation.
- Course-up – As your vessel changes its direction of travel, the chart rotates to keep your COG straight up on the screen. Course-up represents your true

COG as determined by the GPS receiver.

The 972 ignores any course changes if your speed is under half a knot.

The chart reacts very slowly to turns of less than 5°, to avoid annoying small rotations.

Your COG is often different from your vessel's heading, so what you see straight

ahead on the horizon may be different from what's displayed on the screen.

- **Heading-up** – This rotation is available only if you have a heading sensor installed and enabled. The chart rotates as you travel to keep your heading straight up on the screen. When you select heading-up, the heading line on the radar image points straight upwards. The heading line allows you to compare the radar image or the chart with the view in front of the vessel.
- **Leg-up** – The direction of the current leg to a waypoint points straight upwards on the screen. The 972 rotates the chart whenever you start navigating on a new leg, even if you haven't turned the vessel yet.

Using chart rotation in browse mode

Chart rotation is most useful in vessel mode. In browse mode, rotation is stabilized to keep the chart and cursor from jumping while you're browsing around on the chart.

- **Course-up or Heading-up:** Suppose you're displaying the charts as course-up or heading-up and you press the cursor pad to use browse mode. While in browse mode, the chart rotation freezes. If your vessel changes

course, you won't see the chart rotate to the new direction until you return to vessel mode by pressing the **Vessel** key. Only in vessel mode will the chart rotate to follow your course angle.

- **Leg-up:** If you're displaying charts in browse mode as leg-up and the 972 switches to a new leg, the chart will immediately rotate to the direction of that new leg.

NOTES:

The edges of other charts in the 972's built-in world chart folio are shown, in addition to those installed. These edges are shown as black or red dashed lines.

The lat/lon grid is labelled only when the chart is north-up.

How rotating affects the chart and radar

The rotation of the chart and the rotation of the radar image interact under certain circumstances, as described below. Assume that the chart and radar are both north-up at the start:

If the Chart screen's in...	And the radar image is...	
	Overlaid on the chart	Not overlaid
Browse mode	The chart can't rotate in Browse mode. If you change the Control key to Radar , the chart's mode automatically switches to vessel mode and rotates as described below).	The chart can't rotate, but the radar can rotate. Chart and radar can have different rotations.
Vessel mode	Chart and radar both rotate together. If you change the rotation of one, the other automatically changes to match.	Chart and radar can both rotate. Chart and radar can have different rotations.

Setting up the chart screen

The *Chart Options* screen lets you select the details on the *Chart* screen, adjust the 972's track control, and control Demo Mode to simulate navigation and radar.

Press the **CHART** key to display the Chart screen, then press and hold the **CHART** key to display the *Chart Options* screen.

The following options can be set directly from this screen. All units settings apply system-wide.

Left chart type

On a split screen with two charts displayed, choose whether the *left* chart is raster, vector, blend or photo.

Right chart type

On a split screen with two charts displayed, choose whether the *right* chart is raster, vector, blend or photo.

Chart synchronization

On a split screen with two charts displayed, choose whether or not the two charts are synchronized so that both charts always pan together.

Look Ahead

Follow vessel – the vessel is centered in the screen

Look ahead – shows a larger area ahead of the vessel

Predictor

Off, 1, 2, 3, 5, 10, 15, 30 minutes. Controls the length of the course predictor line.

Waypoint Switching

Switch to the next waypoint automatically upon arrival, or require manual switching.

Coordinates

Lat/lon or Phantom Loran TDs

Lat/lon display

Degrees, minutes and seconds or degrees, minutes and thousandths of minutes.

Lat/lon grid

The *ON* setting displays lat/lon lines on the *Chart* screen. Turn lat/lon lines off when these lines add excessive clutter to your screen.

Outlines

Displays the edges of the Passport chart regions. Off, Installed charts, Passport regions, Both.

Dist/Speed Units

Nautical miles and knots, miles and miles per hour, or kilometers and kilometers per hour

Magnetic variation

True or magnetic

Browse popups

On or Off. Displays information next to the cursor about depths, nav aids, obstructions, etc.

False floor

To improve the appearance of below-the-surface colors, this function

compresses the range so that the full range of colors is displayed between the surface and the false floor. Choose Off, 100ft, 250ft, 500ft, 1000ft, 2000ft, 4000ft. (This option applies only when the Shaded relief is turned on).

Depth units

Feet, meters or fathoms.

Raster quilting

Choose whether or not raster charts are quilted to provide a seamless large area of coverage. You may see the edges of the chart coverage area when using this option.

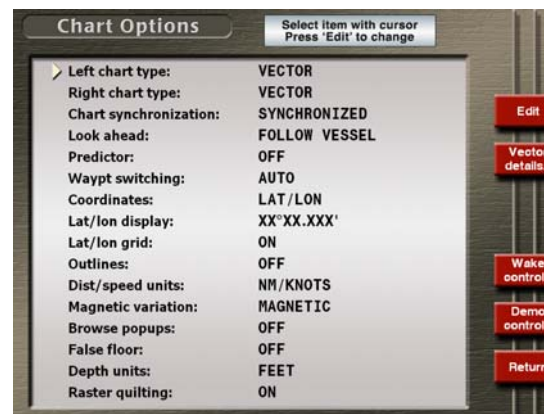
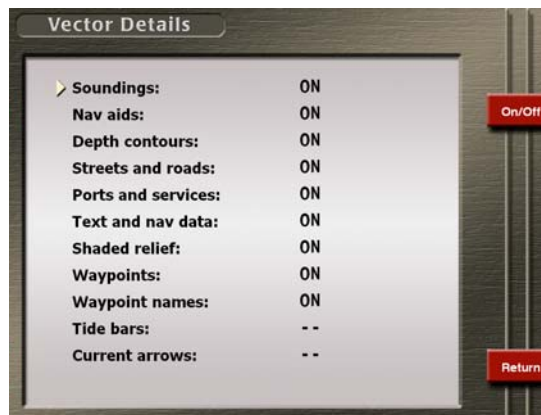


Chart Options screen

Choosing vector chart details

To set up the chart details, press the **Vector details** menu key on the *Chart Options* screen.

To change any option, press the cursor pad to move the cursor triangle to the desired item, then press the **On/Off** menu key to change the item. An item that is turned off is shown with two dashes.



Vector Details screen

The following items are displayed:

Soundings

Display numerical depth soundings on the chart

Nav aids

Display nav aids on the chart

Depth contours

Display depth contour lines

Text and nav data

Streets and Roads

Display streets and roads on land masses

Shaded Relief

The *ON* setting displays water depths as a shaded range of colors. This gives a 3D-like appearance to the chart

Waypoints

The *ON* setting displays your waypoints on the *Chart* screen, and the *OFF* setting turns them off, with the exception of waypoints on a displayed route.

Waypoint names

The *ON* setting displays the name of each waypoint below its symbol. The *OFF* setting displays just the symbol itself.

Tide Bars

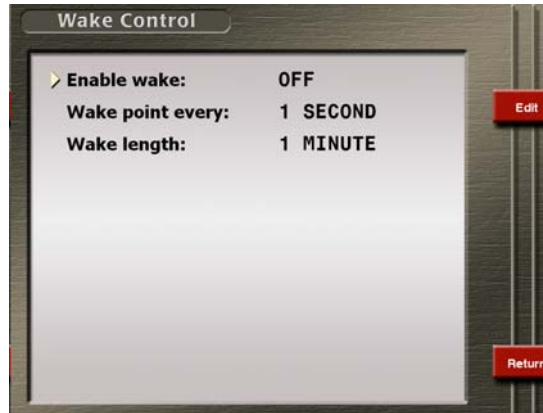
Current Arrows

Changing the wake display

The 972 displays your wake as a line indicating the path you've recently traveled. (The wake is sometimes referred to as a track line). You can choose how often to

store a position fix as a point in your wake and the length of the wake in minutes.

To show the *Wake Display* screen, press **Wake control** on the *Chart Options* screen.



Wake Control screen

To change any of these options, use the cursor pad to move the arrow to the field you want to change, then press **Edit**. Press the cursor pad to display the option you want. Press **ENTER** to lock in the selection.

Enable Wake

Set to *On* to display the wake.

Set to *Off* to turn it off.

Wake point every

You can choose among the following options for point display, and the corresponding track length:

- every 1 second
- every 2 seconds
- every 4 seconds
- every 8 seconds
- every 20 seconds
- every 40 seconds
- every 1 minute
- every 2 minutes

Wake length

Set the length of the displayed wake to 1, 2, 5, 10, 20, 30, 60 or 120 minutes.

Press **Return** twice to return to the *Chart* screen.

Demo control

See *Using demo mode*, on page 19 to use Demo mode for simulating vessel motion in any area of the world.

Using the course predictor line

The chart, 3D steer, and radar screens also display a *course predictor line* that indicates where your vessel will be in a few minutes if you maintain your current course and speed. The predictor line extends out from your vessel in the direction of your Course Over Ground. Its length is determined by your speed and the number of minutes you specify on the *Chart Options* screen. You can also turn the line off.

To use the predictor line, simply select the number of minutes you prefer the line to represent as follows:

1. While on the *Chart* screen, press and hold the **CHART** key to display the *Chart Options* screen.
2. Select **Predictor** using the cursor pad.
3. Press **Edit**.
4. Use the cursor pad to display the desired line length (in minutes).
5. Press **ENTER**.

Then, just watch the predictor line on the chart or 3D steer screen to determine where your current course will take you.

Using the distance and bearing calculator

You can quickly check the distance and bearing between any two points on the *Chart* screen. You can also use this function to make new waypoints that you define by their distance and bearing from another point.

1. Press **WAYPTS/ROUTES**.
2. Press **Distance and Bearing**.

The 972 displays a symbol at the cursor position.

3. Press the cursor pad to move the cursor to the desired location.

The distance and bearing from your position to the cursor is displayed in the info bar.

4. To measure the distance and bearing from the cursor to another point, press **Set new "X."**

A new "X," or starting point, is displayed at that location. As you move the cursor, the distance and bearing from the "X" point to the cursor's position are displayed in the info bar.

If you want to make a waypoint at the cursor location, press **Add waypoint**, then enter its name, symbol, and any description on the *New Waypoint* screen. Press **ENTER** to save it.



Reference section 2

3D maps

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The **3D** key displays your position on a three-dimensional view of the ocean floor or land. Marine charts, topo maps or photos can be overlaid on the image.

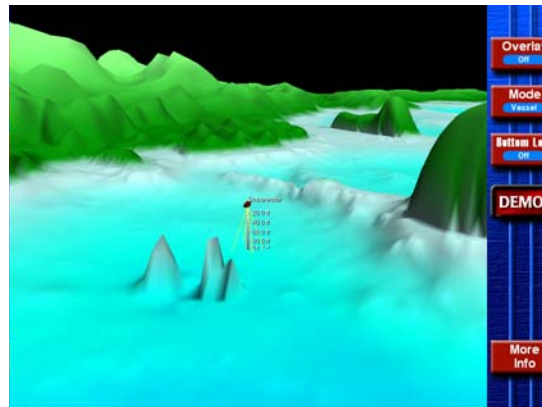
Introduction to 3D images

Using the 972's 3D screens, you can view the ocean floor and land information as a three-dimensional image. You can see favorite fishing spots, harbor entrances, and even navigation channels in a full 3D view, both above and below the water surface.

You can use the cursor pad to “fly” around your vessel to observe your surroundings from a different position.

Note that the first time an area is accessed for 3D display, it may take some time to read the data from the disk drive and process it for display. Blending modes, especially Photo Blending, require a long processing time to prepare an image for display. Once the data is processed, this display updates quickly.

While every effort has been made to provide the best elevation data possible, errors in the source material, data processing and the 3D presentation may occur. The prudent mariner will always have official navigation charts for comparison and as their primary means of navigation.



3D screen

Overlay

Turn *On* or *Off* the overlay selected (may be vector charts or photo) on the 3D Options screen.

Mode

Vessel mode: The camera viewpoint always points toward the vessel, showing it from various angles and elevations.

Browse mode: The camera viewpoint can be moved to any location to show other areas.

Bottom/Lock

On – look at bottom

Off – look at vessel

Camera up

In browse mode, causes the camera to pan upward.

Camera down

In browse mode, causes the camera to pan downward.

More info

Displays additional information at the bottom of the screen.

Configuring the screen

While on the 3D Screen, press and hold the **3D** key to display the *3D Options* screen. You can set the following:



3D Chart Options

Exaggeration

You can set the amount by which the terrain height is exaggerated for ease in viewing. Minor changes in elevation become visible, in an area that might otherwise appear flat. Adjust the exaggeration to best fit your needs, from 1X (no exaggeration) to 60X (extreme exaggeration). The keel marker and depth automatically adjust to the exaggeration factor.

In the Pacific Northwest, exaggeration of 2X usually produces a natural looking image. In the Northeast, try 3X to 5X. Off the Florida coast, try 5X to 10X.

Bottom lock

When Bottom lock is activated on the main 3D screen, this setting controls the height of the camera viewpoint above the seabed. The camera can be positioned at 25, 50, 75, 100 or 200 feet above the sea floor, to look directly under the vessel.

Terrain overlay

Choose Vector chart or Aerial/satellite Photograph to be overlaid on the chart when Overlay is activated on the 3D screen.

Thumbnail

Displays a small image of the area surrounding the vessel in the lower left corner of the screen, to help identify the vessel's location.

False floor

To improve the appearance of below-the-surface colors, this function compresses the range so that the full range of colors is displayed between the surface and the false floor. Choose Off, 100ft, 250ft, 500ft, 1000ft, 2000ft, 4000ft. (This option applies only when the Shaded relief is turned on).

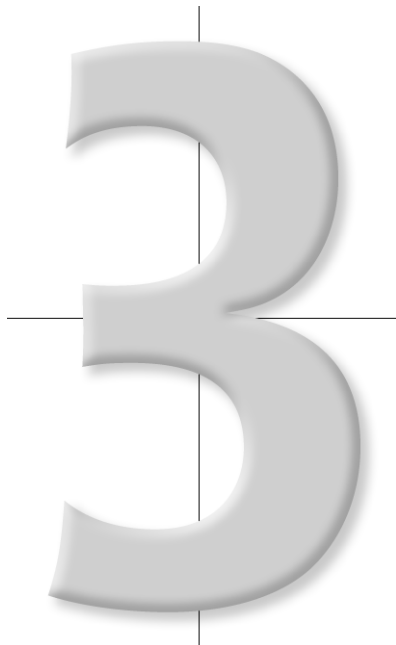
Flying around the vessel

Vessel Mode

In Vessel mode, press the cursor pad left or right to fly around your vessel. Press it up or down to change the elevation of the viewing point.

Browse Mode

In Browse mode, press the cursor pad up or down to move the camera position forward or back. Press the cursor pad left or right to control the camera heading and thus the direction the camera will move when the cursor pad is pressed up or down. Use the menu keys to move the camera position up or down.



Reference section 3
Position coordinates

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The **POSITION** key displays your position coordinates (GPS or Phantom Loran) and lets you check out GPS signal status. COG, SOG, and time of day are also displayed.

Displaying position, COG, and speed

The 972 uses a high-performance GPS receiver as its source of position data, with accuracy enhanced by the WAAS satellite system. The 972 can display position as

latitude/longitude coordinates, or as loran-C coordinates calculated from the GPS data.

Using GPS

Position, Course Over Ground (COG), Speed Over Ground (SOG) as well as time and date are all calculated from the received satellite data. To display this position information numerically, press the **POSITION** key.

When you're using WAAS signals, your position coordinates, as calculated by the 972, may actually exceed the accuracy of some charts.



GPS position screen

You'll see your lat/lon coordinates on the *GPS Position* screen.

If GPS data isn't available, you'll see dashes instead of numbers.

The time of day, and today's day and date are displayed at the bottom of the screen.

The name of the datum currently in use is displayed in the center of the screen. Each marine chart uses a coordinate system described by its datum. Most new charts use the WGS-84 datum.

When using the 972 with WAAS corrections, you'll usually see position measurements accurate to about one to three meters, speed measurements accurate to about 0.1 knot, and COG measurements accurate to about 0.5 degree. WAAS corrections remove most of the errors caused by atmospheric variations.

When the *WAAS* indicator is displayed at the right edge of the screen, the 972 is using this higher level of accuracy. When you require this additional accuracy, be

sure to check often to verify that the WAAS indicator is present.

A brief status summary of the GPS receiver is displayed at the left side of the screen.

Table 1 describes the GPS status messages.

Table 1: GPS status messages

Message	Meaning
-- --	the GPS receiver or its communication link has a problem
3D NAV	navigating with 4 or more satellites in 3-D mode
2D NAV	navigating with 3 satellites in 2-D mode
ACQUIRE	trying to acquire satellites
WAAS	WAAS signals are being used for navigation

Position screen options

To display the *Position* screen options, press and hold **POSITION** while on the *Position* screen.

Dist/speed units

Choose:

- Nautical miles and Knots
- Statute miles and Miles per Hour
- Kilometers and Kilometers per Hour

Magnetic variation

Choose:

- True or magnetic

Lat/lon display

Choose:

- Degrees, minutes and seconds
- Degrees, minutes and thousandths of minutes

Time format

Choose:

- 12-hour clock or 24-hour clock

To designate the time zone for your area, see *Changing the time zone*, on page 153.

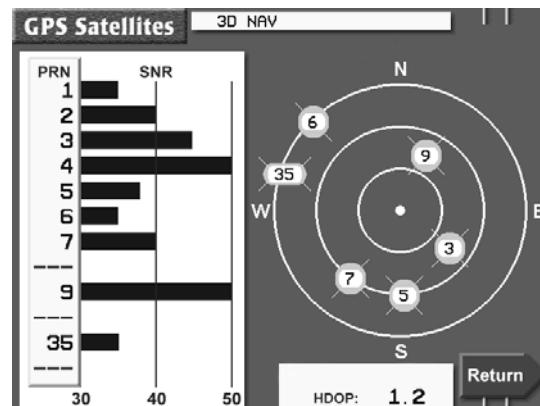
Viewing GPS satellite status

To display more information about the signals received from the GPS satellites, press **Sat info...** on the *GPS Position* screen.

The *GPS Satellites* screen shows the received Signal-to-Noise Ratio (SNR) for each satellite (the higher the SNR, the better the quality of the satellite signals), and a map indicating where the satellites are currently located in the sky. The satellites are identified by their PRN number, a one- or two-digit number assigned by the U.S. government.

GPS satellites are represented by circles; WAAS satellites are represented by ovals.

The center of the satellite map represents the center of the sky, and the outermost ring is the horizon. The view is looking down from above, with east to your right and west to your left.



Satellite status screen

HDOP (Horizontal Dilution of Precision) is a technical measure of the quality of your position fix. It is calculated from the satellites' current positions. You'll usually see an invalid HDOP value displayed immediately after the 972 is turned on, before it's ready to navigate. HDOP can range from an ideal value of slightly less than one, up to poor values of 10 or more. Any value less than two indicates an excellent satellite configuration.

Using Phantom Loran

If you have lists of fishing spots and other waypoints that you recorded as loran time differences (TDs), but you no longer have a loran receiver, the 972 can automatically convert its GPS coordinates into TDs – in real time, as you travel. You can display your current position as TDs or navigate to waypoints using TDs. The accuracy from this conversion is generally 500 to 1500 feet.

This feature, called Phantom Loran, can help your transition from loran to GPS. You can use the 972 to simulate the full operation of a loran receiver, using all of the 972's navigation functions as if it were actually receiving loran signals.

These calculated TDs won't exactly match the positions of previously recorded TDs obtained directly from actual loran signals. In most areas, TD errors shouldn't exceed one microsecond. However, larger errors are possible in areas with poor station geometry, or for which the 972 doesn't have accurate, factory-programmed ASF correction points.

Selecting Phantom Loran

To display position coordinates as Phantom Loran TDs, press the **POSITION**

key a second time to display the *Phantom Loran* screen.

Press it again to return to lat/lon coordinates.

Setting the Phantom Loran GRI

Press **Set GRI** to change the GRI to be used in calculating the displayed TDs. Press the cursor pad to display the available GRIs one at a time. When the GRI is correct, press **ENTER**.



Phantom Loran screen

Press **TD pair** several times to display the pair of TDs you want to use.

4

STEER

Reference section 4

Navigating to Waypoints

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A waypoint is a specific point you designate either by entering its coordinates or by pointing to it on the chart using the cursor. Hundreds of waypoints can be stored in the 972's memory, and can be strung together to form a variety of routes.

Introducing waypoints

To store a route, see page 71.

A *waypoint* is a point (a location) that you've entered into the 972's memory. The waypoint is displayed on the chart with the symbol you've chosen.

Here are some of the functions you can perform with waypoints:

- go to a point on the *Chart* screen in one step (making a "quick" waypoint)
- store waypoints into the 972

- go to these waypoints
- string waypoints together to form routes
- edit or erase waypoints or routes
- plot waypoints on a chart
- transfer waypoints and routes from the 972 to a PC or an older Northstar navigator, and back again

Designating a waypoint

You can designate waypoints in any of the following ways:

- use the cursor on the *Chart* screen to select an existing waypoint or create a new waypoint
- enter numeric position coordinates
- select an existing waypoint from a list

You can also string together several waypoints to form a *route*, and let the 972 guide you from one waypoint to the next (see *Introducing routes*, on page 71).

Designating a waypoint on the chart screen

You can go to a waypoint by moving the cursor to that point on the chart – either selecting an existing waypoint on the *Chart* screen, or designating any other location on the *Chart* screen:

1. On the *Chart* screen, move the cursor pad to choose an existing waypoint or nav aid, or any unmarked chart position.
2. Press **Go to waypt**. (If you didn't choose a waypoint, the key will read **Go to cursor** or **Go to navaid**.)
3. Press **ENTER**.

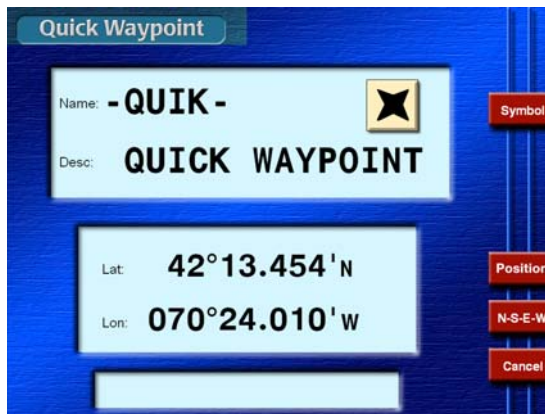
If you selected an existing waypoint, the 972 begins guiding you directly to it.

If you chose a new cursor location, the 972 makes a new waypoint named -QUIK-, and guides you directly to it. Repeating this same procedure will create a new -QUIK- waypoint that overwrites the existing one; therefore, you may want to save the -QUIK- waypoint as a regular waypoint by renaming it. See Editing waypoints, starting on page 69.

Entering a waypoint's position coordinates

You can use the keypad to enter waypoint coordinates, and then go to that waypoint:

1. Press **WAYPTS/ROUTES**, then press **Quick waypoint** to display the *Quick Waypoint* screen.



Quik waypoint screen

2. If necessary, select the type of coordinates you want to enter by pressing the **Position** menu key:

- Lat/Lon
- Loran – loran TDs (make sure the GRI displayed is correct, and change it if necessary)
- Dist / Brg – distance and bearing from “here” (your present position), or from any waypoint stored in the 972

3. Use the keypad to enter the waypoint's coordinates.

The initial position shown is your latest fix.

If you wish, you can now give the -QUIK- waypoint a unique name after you've entered its coordinates, since the next -QUIK- waypoint you make will overwrite this one: Just move the cursor to the name field and change the name from -QUIK- to a unique permanent name before continuing.

4. Press **ENTER** twice.

The 972 begins guiding you directly to the waypoint.

Using previously stored waypoints

If you have already stored waypoints as described starting on page 65, you can select one of these and navigate to it.

1. Press **WAYPTS/ROUTES**, then press **Waypoints**.
2. Press **Next view** to display the most convenient view. You can select a waypoint from the chart view, or from one of the waypoint lists

(often the *local* list, since the waypoints you navigate to are usually nearby). See *Displaying waypoints*, starting on page 64

3. Press the **CURSOR PAD** to select the waypoint you want to navigate to.
4. Press **Go to**, then press **ENTER**.

The 972 begins guiding you directly to the waypoint.

Waypoints (local)		23 WAYPTS	1% FULL
▶	-QUIK- QUICK WAYPOINT	54.64 ^M	028 [°]
	(0016) 07:53:07 16SEP04	9391 ^M	234 [°]
	(0015) 07:53:01 16SEP04	9492 ^M	234 [°]
	(0017) 07:53:14 16SEP04	9514 ^M	235 [°]
	SLIME	9516 ^M	235 [°]
	OTHER	9522 ^M	235 [°]

Local waypoints list

Steering to a waypoint

1. On track



2. Off track, come left to return



3. Off track and moving towards course line



4. Off track and moving away from course line



If your 972 is interfaced to an autopilot, it can steer your vessel automatically along a track line directly to the active waypoint.

To steer the vessel yourself, press the **STEER** key. The 972 displays a picture of your vessel and the desired track line. Just steer to keep the vessel close to the track line (see examples at left).

This precise navigation is especially useful for following a harbor channel or a line between shoals and sandbars.

You can also steer using the Chart screen when you just want to get to a waypoint and

don't need to stay precisely on the designated course line.

The following is also displayed in the *Steer* screen:

- distance and bearing to the waypoint
- Speed-Over-Ground (SOG)
- Course-Over-Ground (COG)

If you exceed the cross-track alarm distance, the 972 issues an alarm. To display this alarm message, press the **STAR** key. To clear the alarm, press **Clear alarm**.

Steer Screens

There are two versions of the steer screen. The *2D Steer* screen is a simple graphic display of cross-track distance. The *3D Steer* screen is similar, but from an “overhead” perspective view that also shows nearby waypoints.

Press **STEER** to switch between the screens.

The 2D steering screen

The *2D Steer* screen uses a traditional two-dimensional display that shows your cross-track distance – how far your vessel is from your intended track line (the center line of the display). The vessel symbol on the display rotates as your vessel turns, showing whether you are moving closer to the line or further from the line.

Ideally, you’ll keep the vessel symbol close to the track line and parallel to it.

The scale of the cross-track display is shown near the bottom of the screen. To change the cross-track scale, press the zoom **IN** or **OUT** keys.

If the cross-track alarm is turned on, the alarm limits are displayed as red lines within the cross-track display.

Note that the heading correction display on the 2D screen (showing “Come 30° Right,” below) indicates the heading change

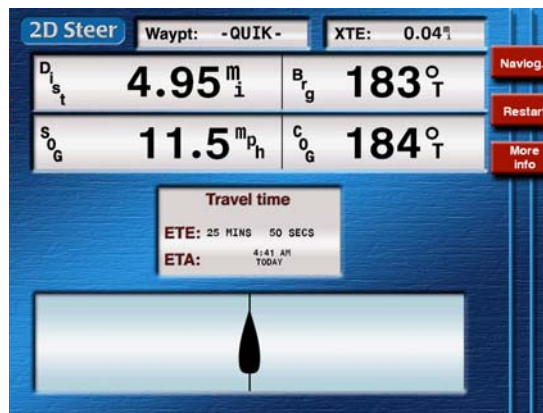
*needed to sail parallel to the desired track line. This is the correction to make **after** you are on the line.*



2D Steer screen — approaching the track line

The direction in which your vessel symbol is pointing tells you the direction you’re actually travelling (your COG). This direction may not be the same as your heading, if any current or wind is present.

When the 972 sequences to a new leg of a route, your vessel symbol will immediately show your COG relative to the new leg.



2D Steer screen — vessel on track

The distance and bearing to the waypoint, your Speed-Over-Ground (SOG) and Course-Over-Ground (COG) are displayed in the upper half of the screen.

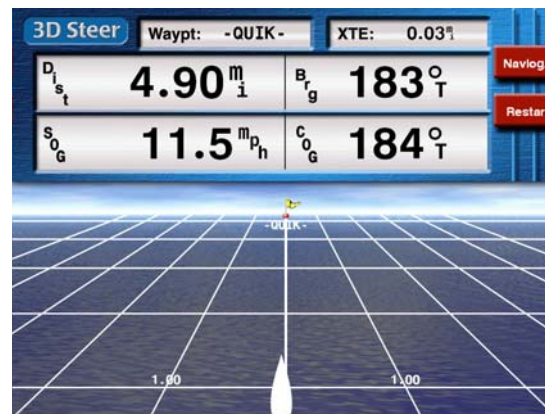
You can display additional information in the center of the *2D Steer* screen by pressing **More info** to cycle through the three choices:

- Travel Time – Estimated Time Enroute (ETE) to the waypoint, and Estimated Time and Date of Arrival (ETA)
- Waypoint – Waypoint name, description, and position coordinates
- SOA – Speed of Advance and graphical heading correction

The 3D steer screen

The *3D Steer* screen is similar to the *2D Steer* screen. It displays a three-dimensional view of your vessel with the current waypoint, the course line to the waypoint, and the locations of any other nearby waypoints ahead of your vessel.

You can use the **ZOOM** keys to zoom in and out, changing the scale.



3D Steer screen

Steering on the chart

You can also steer by watching your progress directly on the chart screen, rather than using the steer screens described above. Several aids in the 972 help you do this:

- **dotted green line** on the chart shows the original track line from your *initial* vessel position to the waypoint

- **dotted red line** on the chart shows the direct line from your *current* vessel position to the waypoint
- **a pair of blue dotted lines** surrounding the original track line to the waypoint show the width of the allowable cross track error. These lines will be present only if the Cross Track alarm is turned on)

Note that the blue circle surrounding each waypoint represents the allowable cross track error, **not** the arrival radius.

The course predictor line

The course predictor line (see *Using the course predictor line*, on page 38) provides another effective way to navigate a course line or even to navigate directly to a point on the chart. On the chart or radar screen, just keep the end of the predictor line near the intended course line, and your vessel will steer towards and gently merge with the line.

The predictor line is also shown on the 3D steer screen where it may appear curved to represent the actual track on the 3D grid.

Navigating along routes

To follow a previously stored route, press **WAYPTS/ROUTES**, then press **Routes** to display the *Routes* list. Press the cursor pad to select the route you want to follow, then press **Go**. The 972 displays a chart showing the chosen route.

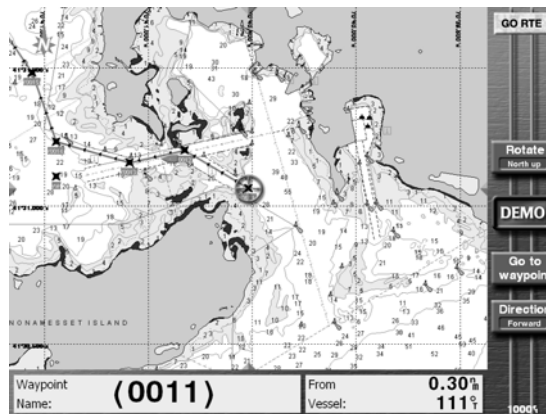


Chart screen, showing a route

From here, you can do the following:

- select a starting waypoint or leg
- start following the route
- reverse the route

Selecting the starting point

The nearest waypoint in the route is automatically selected as the starting point. To choose a different waypoint or route leg, press the cursor pad and select it on the

chart. You can zoom **IN** or **OUT** to see a smaller or larger area of the route.

Starting a route

To go directly to the selected waypoint in the route, press **Go to waypoint**, then press **ENTER**. The 972 calculates a track line from your present position to the selected route waypoint. Your cross track error starts at zero.

If you wish to start navigating along a route leg, rather than directly to a waypoint, select the leg by moving the cursor onto the leg, then press **Follow leg** and press **ENTER**. In this case, your initial cross-track error is your distance from that leg. Arrows on the leg indicate the direction of travel.

Reversing a route

To follow the route in the reverse direction, press **Reverse** before starting the route. The direction of the route and its arrows will change from end to end.

Restarting the track line

When travelling from one waypoint to another, you may find you've gone off your planned track line. Maybe you avoided an obstacle or drifted slightly off-course. Whenever you're off-track, you can get back by one of two methods:

- after passing the obstacle, you can steer your vessel back to the original track line by using the cross-track error display, and simply continue to the waypoint (Track 1 in Figure 2)
- after passing the obstacle, if you don't need to return to your original track line, you can go directly to the next waypoint by using the 972's restart function (Track 2 in Figure 2)

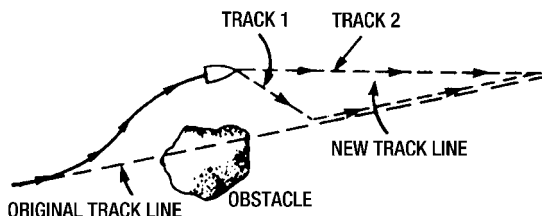


Figure 2: Restarting the course line

To restart your track line from your present position, press **Restart** and **ENTER**.

Restart is found on the *Chart* screen (in vessel mode only) and on the *Navlog* screen.

The 972 calculates a new track line from your present position directly to the next waypoint, and resets your cross-track error to zero.

The NAVLOG screen

The *Navlog* screen displays the waypoints in your current trip and lets you easily make changes to them. To access the screen, press the **Navlog** key on the *Steer* screen.

The navlog helps you plan and log your trip, using three main functions:

- displaying your progress along your trip
- allowing you to easily change the rest of your trip (add waypoints to a route, or reverse the entire trip)
- allowing you to sequence to the next leg, if you've chosen manual waypoint sequencing

The nav log contains the series of waypoints that you follow along your route and displays them in sequential order. When you navigate to these waypoints, or along an already stored route, the series of waypoints is copied into the nav log, which acts as a kind of "scratch pad" to monitor your progress. You can change the nav log's route in any way you want without affecting the original route, which remains safely stored in the 972.

To see the waypoints you're currently navigating along, press the **Navlog** key on either *Steer* screen.

The *Navlog* screen shows the list of waypoints, the length and bearing of each leg, and the direction of your next trip leg.



Navlog screen

Press the cursor pad to scan the waypoints in the list.

To display either a waypoint's description or its estimated time of arrival (ETA), press the **Display** menu key. For waypoints you haven't passed yet, the times of arrival shown are estimates based on your current speed. For waypoints you've already passed, actual times of arrival are shown. The 972 updates this information as you travel.

NOTE:

Estimated times are just estimates, which may be inaccurate if your SOG changes, either intentionally or by passing through varying currents.

Your ETA at the last waypoint (your destination) is shown at the top of the screen. A red arrow connecting the right ends of two waypoint boxes indicates you've completed that leg of the trip.

Changing your trip

Adding waypoints to your trip

You can add waypoints to your trip at any time:

1. On the *Navlog* screen, press the **Append waypt** menu key to display a chart view of the trip waypoints on the *Append Waypt* screen.
2. Press the cursor pad to select the desired waypoint.
3. Press the **Select waypt** menu key, then press the **ENTER** key to add the waypoint to the nav log.

NOTE:

Any waypoints added in this manner aren't permanently added to the original route stored in the 972. To permanently change a route, you must use the edit-route function. (For details, see "Editing a route" starting on page 76.)

4. Repeat these steps for any more waypoints you want to add.

NOTE:

If you go to a waypoint or along a route by using the 972's GO TO function, the unit automatically enters and organizes the waypoints in the navlog.

Reversing your trip

You can reverse your trip at any time. Pressing the **Reverse** menu key on the *Navlog* screen lets you travel the trip in the opposite direction.

Stopping and restarting navigation

Stopping navigation

Whenever you press the navlog's **Stop** menu key, the 972 stops navigating, and won't display distance and bearing to waypoints or ETA or ETE.

Restarting navigation

You can restart navigation along any leg or to any waypoint of the trip. On the *Navlog* screen, move the cursor arrow to highlight the waypoint or leg. When you select a waypoint, a triangle points to the waypoint. When you select a leg, an arrow points from the first waypoint to the second. Press the **Restart** menu key.

Editing the Navlog

You can add or delete waypoints from the navlog, provided you first stop navigation as described above.

You can clear the Navlog by pressing **CLR** and **ENT** while the navlog is displayed

5



Reference section 5

Creating waypoints and routes

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This chapter explains how to create new waypoints and modify existing ones, how to make a route from stored waypoints, and how to create a route by saving it as you travel. You'll also learn how to change a route by inserting, removing or changing the order of its waypoints.

Displaying waypoints

To display waypoints, press the **WAYPTS/ROUTES** key, then **Waypoints**. You can press **Next view** to step through the four available waypoint screens listed below:

- waypoints displayed on the chart
- a list of up to 30 *local* waypoints, sorted by distance (nearest first)
- a list of *all* waypoints, sorted alphabetically
- a list of up to 30 local *avoidance* waypoints, sorted by distance (nearest first)

The waypoint screen type is shown in the upper right corner.

Waypoints on the chart screen

The *Waypoints chart* screen displays your waypoints graphically. You can press the cursor pad to display other areas of the chart, and press the **OUT** or **IN** zoom keys to see more or less chart area.

NOTE:

If you've turned off the display of waypoints on the Chart screen, you'll only see waypoints that are currently in use for navigation.

Waypoints on the local list

The *Waypoints (local)* screen displays up to 30 of the closest waypoints (within 100 nm) in order of their distance from your present position. This list is particularly useful for working with the waypoints in your area. Often these are the only waypoints you may be interested in at the moment.

Waypoints on the alpha list

The *Waypoints (alpha)* screen displays all stored waypoints in alphabetical order. Waypoints with a digit as the first character appear at the beginning of the list. Those starting with a dash or parenthesis are at the end.

Waypoints on the avoidance list

The *Waypoints (avoidance)* screen displays up to 30 of the closest avoidance waypoints (within 100 nm) in order of distance from your present position.

Using the waypoint lists

After you've stored a few waypoints in the 972, you can press the cursor pad to move

up or down within a waypoint list to select individual waypoints.

When you display a waypoint list, you can see their coordinates in either of the following ways by pressing the **Position** menu key:

- as lat/lon coordinates
- as distance and bearing from your position (often the most useful way to display coordinates, since it may be easier to visualize “3 miles north” than lat/lon digits)
- as Loran TD’s

Creating new waypoints

There are two easy ways to create a new waypoint:

- numerically – by entering position coordinates as lat/lon, loran TDs, or distance and bearing on the *New Waypoint* screen
- from the chart – by pointing to the waypoint’s location on the *Chart* screen

Assigning a name and description

To permanently store a waypoint, you must give it a *name*. The name can be from one to six characters long, and must be different from all the other waypoint names stored in the 972. You can also enter a description of up to 16 characters on the line below the name.

Assigning a symbol

You can give the waypoint a symbol so you can easily identify it on the *Chart* screen. When creating or editing waypoints, you can choose from a list of symbols, displayed in the upper right corner.

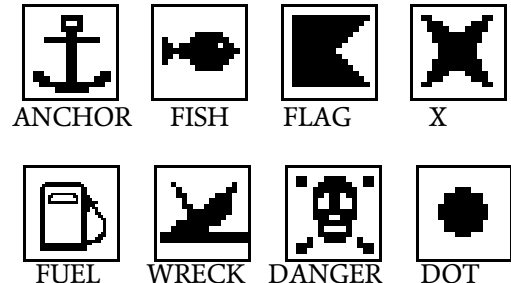


Figure 3: Typical waypoint symbols

Entering waypoints numerically

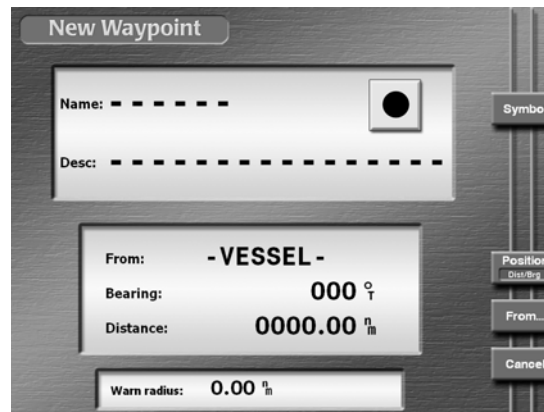
To enter waypoints numerically:

1. Press **WAYPTS/ROUTES**.
2. Press **Waypoints...**



Local Waypoints screen

3. Press **New...** to display the *New Waypoint* screen.



New Waypoint screen

4. Enter a waypoint name and optional description.

Press (several times if necessary) the key on the 972 keypad that contains the letter or digit you wish to enter. Press the cursor pad when necessary to move the cursor to the next character.

5. Choose a symbol for the waypoint by repeatedly pressing **Symbol**.
6. Enter the waypoint's coordinates. To switch between displaying coordinates as lat/lon, as loran TDs, or as distance and bearing coordinates, press **Position**:
 - For lat/lon, the **N-S-E-W** key lets you manually change the hemisphere, if necessary.

- For loran TDs, enter any valid pair of TDs and the GRI for the pair. After entering the GRI, check the name of the GRI that's automatically displayed to ensure it's correct.
- For distance and bearing from your present position, leave the *From* point set to **-VESSEL-**, and enter the bearing and the distance to the desired waypoint.
- For distance and bearing from a waypoint, press the **From** menu key to display a chart screen. Press the cursor pad to select the desired waypoint and press **Select waypoint**, or create a new waypoint at the cursor location by pressing **Add waypoint** followed by **Select waypoint**. Enter the bearing and the distance from the designated waypoint to your new waypoint.

*If you change your mind and want to return to specifying distance and bearing from your present position instead of from another waypoint, press **From vessel** on the chart screen.*

7. Press **ENTER** to permanently store the new waypoint.

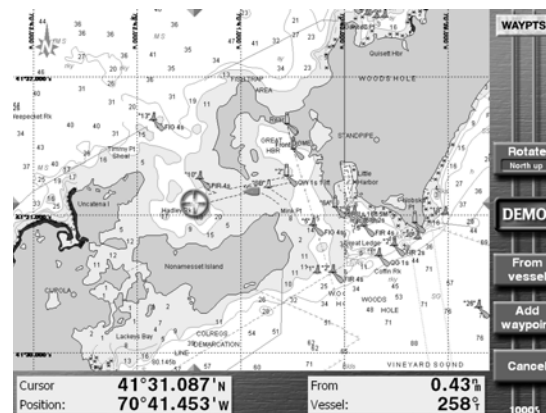
NOTE:

Don't enter a number into the Warn radius box unless you want to make this waypoint an avoidance point, as described in the next section.

Entering waypoints on a chart screen

To enter waypoints on a *Chart* screen:

1. Press **WAYPTS/ROUTES**.
2. Press **Waypoints**. If necessary, press **Next view** to display the *Waypoints chart* screen.



Waypoints chart screen

3. Press the cursor pad to move the cursor to the position of the new waypoint. You can zoom in or out, as necessary, to precisely place your waypoint.

4. Press **Add waypoint** to capture the cursor coordinates and display the *New Waypoint* screen.

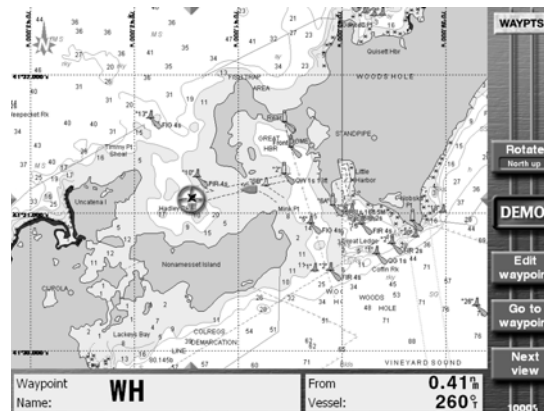
5. Now follow the instructions above for **entering a waypoint numerically**, starting with Step 4. The coordinates of the cursor (Step 6) will be already entered — don't change them unless you mean to.

Creating avoidance-area waypoints

You can make *avoidance areas* from new or existing waypoints. Then, if you travel into a designated avoidance area, the 972 will sound a beep and flash an alarm on the screen.

The 972 displays an avoidance area on the *Chart* screen as a waypoint surrounded by a circle. The circle is the avoidance area's warning radius, which you set when you create or edit the waypoint. You can use the international “slashed circle” no-entry symbol as the avoidance point's symbol to help you quickly see it on the chart.

The waypoint is treated as an avoidance point only if you specify a warning radius larger than zero. In other words, just assigning the slashed circle symbol to a waypoint doesn't cause the 972 to treat that waypoint as an avoidance point.



CAUTION!



The avoidance alarm is only an extra safety feature to help alert you to possible hazards. It doesn't replace local knowledge, proper use of charts, the person on watch, or any other aspects of good seamanship that are required to safely navigate.

To make any waypoint act as an avoidance point, enter a number in the *Warn radius* box at the bottom of the *New Waypoint* or *Edit*

Waypoint screen. The warning radius can be from 0.1nm to 4.99 nm.

Be sure to allow a little extra distance around the hazard area so you'll have time to respond by turning or stopping after you hear the alarm, and to allow for the typical accuracy of the navigation source in use.

Setting the avoidance-area alarm

The 972 will sound an audio alarm when you enter an avoidance area, provided you've turned on the audio alarm. (See "*Alarm audio*" on page 136.)

Editing waypoints

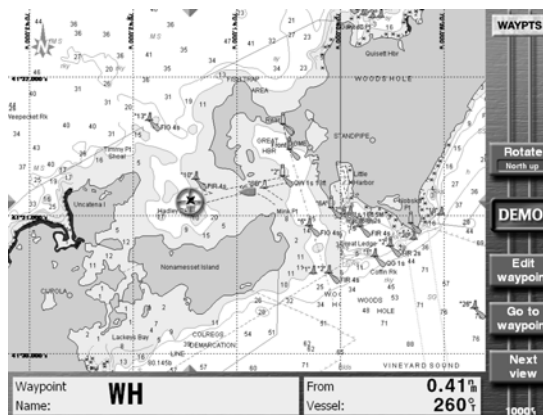
You can change any information about an existing waypoint (except for the type of coordinates used to save it) or erase it entirely by using the 972's waypoint editing function.

2. Select the waypoint by highlighting it with the cursor pad.

Changing waypoints

To change a waypoint's name, description, position coordinates, or warning radius:

1. Press **WAYPTS/ROUTES**, then **Waypoints**.
If necessary, press **Next view** to display the waypoint screen you want.



Waypoint "WH" selected

- To edit the waypoint, press **Edit**. (On the *Waypoints chart* screen, the key is labelled **Edit waypt.**)



Edit Waypoint screen

The *Edit Waypoint* screen appears, allowing you to make changes just as if you were entering a new waypoint. Press **ENTER** when done.

If the waypoint is in an active navplan, you must stop navigating before editing it.

NOTE:

If you move the waypoint, any routes containing this waypoint will be changed to reflect the waypoint's new position.

A warning is displayed before any routes are changed.

Erasing waypoints

To permanently erase the waypoint, press **Erase** on the *Edit Waypoint* screen, then **ENTER**.

*You can't erase a waypoint if it's used in a route—you must first remove it from the route. For details about editing routes, see *Editing a route*, starting on page 76.*

Updating waypoint coordinates

You can "fine tune" a waypoint's position by actually sailing to the exact desired position and setting the waypoint's stored coordinates to your present position. You

can do this on the *Waypoints chart* screen or any of the waypoint list screens.

To update the waypoint's coordinates to your exact position, display the *Edit Waypoint*

screen for the waypoint as described above. When your position is correct, press **Update position** and **ENTER**.

Introducing routes

A *route* is a sequence of waypoints that you designate. Routes can be used to perform the following functions:

- as guidance through a channel or harbor
- as a quick and efficient path to good fishing spots
- as the best way around a permanent obstacle, such as an island
- as guidance on a single long voyage with various "legs" to food and fuel stops along the way, or to other temporary destinations

Waypoints in a route are connected by straight lines called *legs*. The 972 can follow route legs in a forward or backward direction. You can start following a route in either of two ways:

- go directly to any waypoint in the route, then automatically continue on the next leg (cross-track distance starts at zero, because you're on the course

line from your present position to the waypoint)

- start along any leg of the route (cross-track distance starts at your distance from the leg)

See "Navigating along routes" beginning on page 58.

You can create a route in three different ways:

- use the *Chart* screen to choose a sequence of waypoints
- use a waypoint list to choose a sequence of waypoints
- save a route's waypoints as you travel

Route and waypoint capacity

A route can have up to 35 waypoints. You can store as many as 500 routes in the 972, but the maximum number depends on the number of stored waypoints. Each route takes up space that otherwise could be occupied by one or two waypoints.

Creating a route from the chart

To create a route graphically from the *Chart* screen:

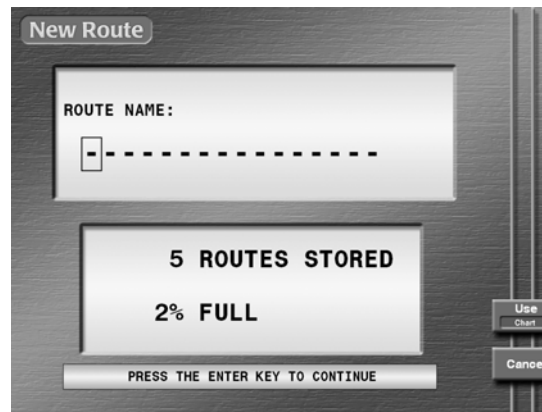
1. Press **WAYPTS/ROUTES**, and then press **Routes**.

The names of any previously stored routes are shown on the routes list.



Routes list screen

2. Press **New...** to display the *New Route* screen.



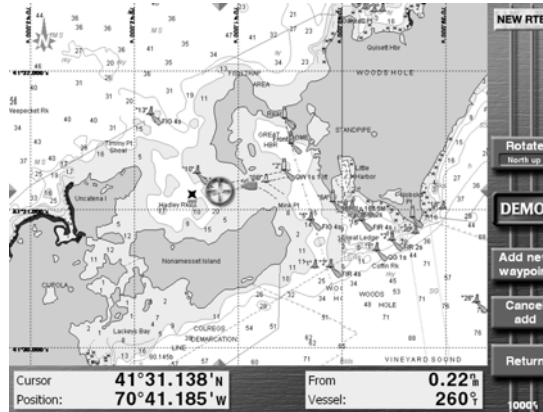
New Route screen

3. Enter the name of the new route using the keypad and cursor pad.
4. If the **Use Chart** menu key is displayed, press it to change from list-based entry to chart-based entry.
5. Press **ENTER**.

The New Route chart screen is displayed; you may now start selecting waypoints for the new route.

6. To add waypoints to the route, move the cursor to the first waypoint's location, which can be a nav aid, an existing waypoint, or any unmarked point on the chart. Press **Add**

new WP. (If an existing waypoint is selected, the menu key will read **Add waypt.**)



New Route chart screen

Newly created waypoints are named (0001), (0002), etc. The parentheses indicate that the

waypoint was automatically named, and the four-digit number uniquely identifies each waypoint. Also, each new waypoint is automatically given a description showing the time and date you stored the waypoint.

7. Continue creating the route by moving the cursor to each desired waypoint location and pressing either **Add waypoint** or **Add new WP**. A line is drawn on the *new route* screen connecting the waypoints, with small arrows indicating the direction of the route.
8. At any time, you can press **Cancel add** to stop appending waypoints, and then select a route leg or waypoint to continue editing a different part of the route.
9. When finished, press **Return** to switch to the *New Route* screen to see all of the route's waypoints.

Creating routes from a list of waypoints

To create a route from a list of existing waypoints:

1. Press **WAYPTS/ROUTES**, then press **Routes**.
2. Press **New** to display the *New Route* screen.
3. Enter the name of the route using the keypad and cursor pad.
4. Press **Use** to change from chart-based editing to list-based editing.
5. Press **ENTER**.

6. Press **Insert...**

The Select waypt screen appears, listing all of your stored waypoints.

7. If you want to switch between the *local* and *alpha* lists, press **Next view**.
8. Move the cursor to select the desired waypoint, then press **ENTER** to place the waypoint in your route. Or, press **New** to create a new waypoint, then add it to the route.
9. Repeat Steps 6, 7 and 8 until your new route is complete.

To see or edit the route on the Chart screen at any time, press **CHART**. Press

Return to go back to the new route entry screen.

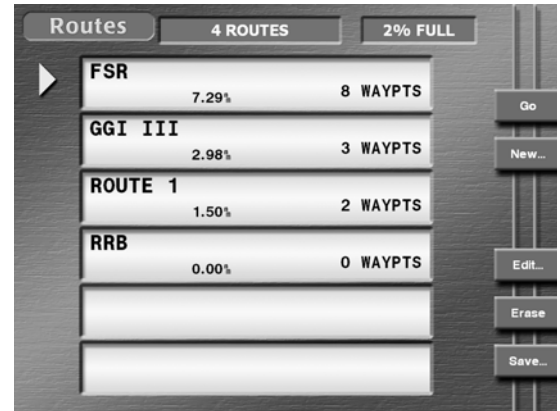
Saving a route as you travel

To make a record of a trip that you may want to repeat later, you can save waypoints into a route as you travel by pressing the **SAVE/MOB** key every time you pass a point you want to store in the route.

The save-route function makes this a very simple process: First, you tell the 972 that you want to save a route as you travel, then you press **SAVE/MOB** as you pass each new waypoint, then you tell it to stop saving the route when you reach the end of the route.

To begin saving a route as you travel:

1. Press **WAYPTS/ROUTES**, and then press **Routes** to display the *Routes* screen:



Routes screen

2. Press the **Save** menu key to set up saving a route automatically.

The Save Route screen is displayed, asking you to enter the name of the new route to be saved.

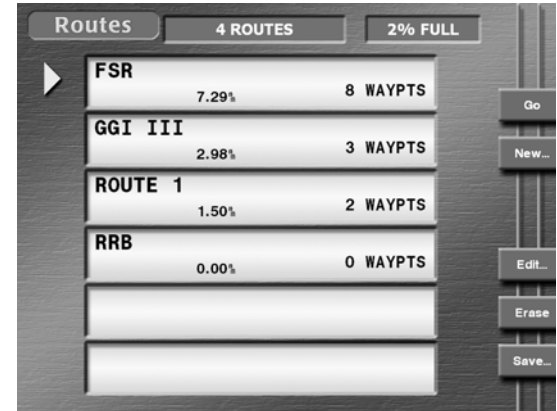
If you use the name of any existing route, waypoints will be added to the end of that route.



Save Route setup screen

Enter the name of the route to be saved using the keypad and cursor pad, then press **ENTER**.

The unit displays the message “saving to route:” at the bottom of the Routes screen, confirming the name of the route being saved.



Routes screen — saving a route

- As you pass the location of each desired waypoint, press **SAVE/MOB**.

The vessel's location will be saved as a waypoint, and the waypoint will automatically be added to the route being saved. The waypoint is stored with a name similar to (0001). The parentheses indicate that the waypoint was automatically named, and the four-digit number uniquely identifies each waypoint. Each waypoint is also given a description with the time and date you stored the waypoint.

NOTE:

While you're automatically saving a route, you can also access all of the unit's navigation functions (except you can't edit the route you're presently saving).

*To check whether you're still saving a route, press **WAYPTS/ROUTES**, then **Routes** to*

display the Routes screen. If you're still saving a route, the message "saving to route:" is displayed at the bottom of the screen.

If the route becomes full (35 waypoints), you may want to stop saving to this route and start a second one.

To stop saving a route:

1. Press **WAYPTS/ROUTES**, then press **Routes**.
2. Press **Stop save** and **ENTER** twice.

Editing a route

You can make changes to a route graphically using the *Chart* screen or you can change it using a list of its waypoints.

You can make any of the following changes:

- change the route name
- add new or existing waypoints to the beginning, middle, or end of the route
- remove waypoints from the route
- erase the entire route

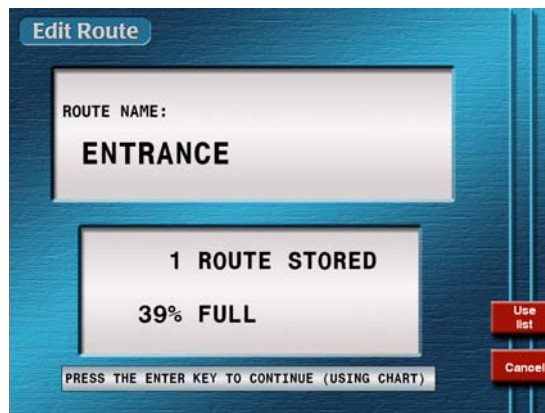
To edit a route:

1. Press **WAYPTS/ROUTES**, then press **Routes** to display the *Routes* screen.



Routes screen

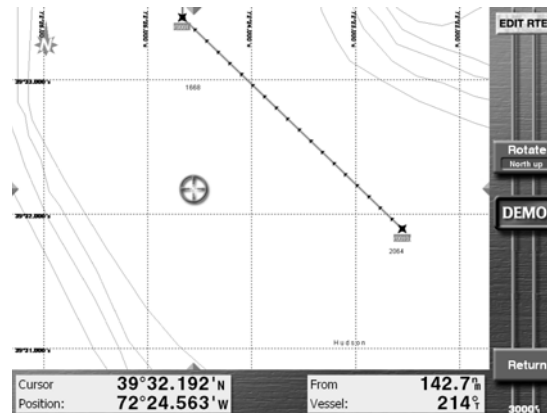
2. Press the cursor pad to select the route you want to change, then press **Edit**. The name of the route is displayed on the *Edit Route* screen.



Edit Route screen

3. If you want to change the route's name, do so now.
4. Press **Use** to change from chart-based editing to list-based editing.
5. Press **ENTER**.

You can alternate between list and chart editing at any time.



Editing a route on the chart

The direction of the route is indicated by a series of small arrows in each leg, and the cursor is in the middle of the screen.

Editing from the chart is described below; editing from a list of waypoints is described in *Editing a route using a waypoints list*, starting on page 78.

Editing a route using the chart

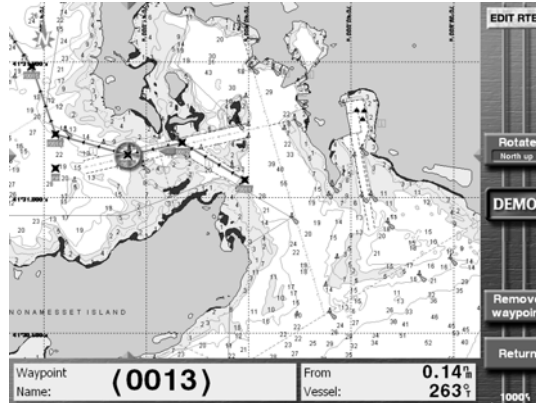
After you have accessed a route as described above, you can add or remove waypoints using the chart as follows:

Adding waypoints to a route

You can add waypoints to the end of a route, or to the beginning, or the middle, depending on the choice you make in step

one below. After having accessed a route, as described in *Editing a route*, starting on page 76:

1. Press the cursor pad to move the cursor onto the route's last waypoint (or first waypoint, or a leg).



Waypoint (0001) selected in the route

2. Press **Add to end** (or **Add to front** or **Split leg**).
3. Move the cursor to the location that you want to add to the route (either an existing waypoint, or any other spot).

As you move the cursor, the 972 displays the new route leg as a dotted line to the cursor position.

4. Press a menu key once to add the waypoint:
 - If you selected an existing waypoint, the key is marked **Add waypoint**.

- otherwise, the key will read **Add new waypoint**.
- If you're adding a waypoint to a leg, the key is marked **Split leg**. Move the cursor to the new waypoint position and press **Insert new waypoint**.

5. Repeat for each new waypoint or cursor location you want to add to the route.
6. When you're finished, press **Cancel add**.

*Instead, you can press **Return** to switch to list-based editing.*

Removing waypoints from a route

To remove waypoints from the route (the waypoint is not erased from the 972):

1. Move the cursor to the waypoint you want to remove, then press **Remove waypt**.

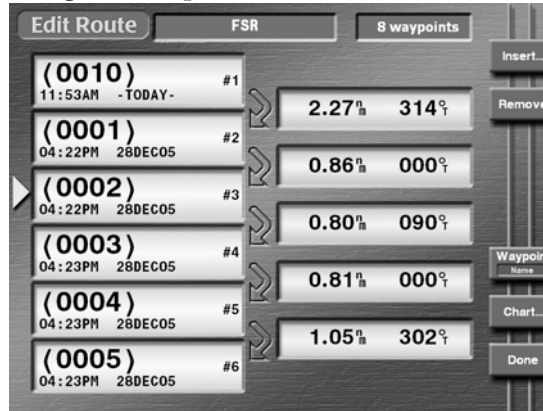
*Even if you remove all the waypoints from a route, the 972 still retains the empty route. To remove the route entirely, see *Erasing an entire route*, on page 79.*

2. When done, press **Return** to go to list-based editing.

Editing a route using a waypoints list

After you have accessed a route, as described in *Editing a route*, starting on

page 76, you can add or remove waypoints using the waypoints list as follows:



Editing a route using the waypoints list

Adding waypoints to a route

1. Press the cursor pad to move the pointer at the left side of the screen to the spot *in between* two existing waypoints where you want to insert a new waypoint.
*(To add a waypoint to the beginning of the route, be sure to position the pointer **above** the first waypoint, not right onto it.)*
2. Press **Insert** to display the *Select waypoint* screen that lists all your stored waypoints. To switch between the *local* and *alpha* lists, press **Next view**.
Note: you can't add an avoidance point to a route.
3. Move the cursor to select the desired waypoint, then press **ENTER** to add the waypoint to the route.

Removing waypoints from a route

1. Press the cursor pad to move the left-hand pointer directly onto the waypoint you want to remove.
2. Press **Remove**.
3. Press **ENTER**.

Erasing an entire route

To erase a route:

1. On the *Routes* screen, press the **CURSOR PAD** to select the route you want to erase.
2. Press **Erase**.
3. Press **ENTER**.

Editing a route you're navigating along

When you follow a route, the route's waypoints are copied to the *navplan* for safekeeping. The navplan is displayed on most chart screens and on the *Navlog* screen.

If you change a route you're navigating along, the 972 stores the changes, but they won't appear in the navplan you're following. To activate these changes in your current navigation, you must start following the route again.

If you edit the coordinates of a waypoint directly in the navplan, you'll receive a

warning, as this might result in an unsafe path. You cannot erase a waypoint that is

in a route or the navplan; it must be removed from the route first.

Transferring waypoints/routes to other units

Networked 972's automatically share data. This section only applies to transferring data to or from the older Northstar units.

The 972's import/export function lets you transfer all waypoints and routes between a 972 and a Northstar 941, 951, 952, 957, 958, or 6000i.

NOTE:

To import or export waypoints and routes to and from older Northstar units, these older units must contain software version 3.12 or higher. To obtain any necessary upgrades, please see your authorized Northstar dealer.

You can perform the transfer from either unit. The other unit can remain in normal operation, including the displaying of different screens, as long as you do not edit any of its waypoints or routes during the transfer. It is preferable to stop navigating on the receiving unit by pressing **STEER**, **Navlog**, and then **Stop**.

The unit you operate to perform the transfer is called the "control unit." The instructions here apply to operating the 972; if you choose to operate the controls

on an older unit to perform the transfer, the instructions may be slightly different.

Be sure to choose the right function for what you want to do: *import* waypoints and routes *from the second unit*, or *export* waypoints and routes *to the second unit*.

Connecting the two units

The two units must be properly connected with the correct cabling and port settings. For interfacing information, contact your authorized Northstar dealer. To enable transfers on the 972, go to the *Port Setup* screen, change the *Aux Port* to "D/B XFER," and turn the unit off and then on.

Transferring waypoints and routes

When you transfer waypoints, the *entire contents* of one unit's database are moved into the other. They will be added to the waypoints and routes already in the receiving unit. If any exact waypoint or route name matches exist, the waypoints or routes from one unit will *overwrite* the waypoints or routes already in the other.

NOTE:

If you press any function key on the control unit during the transfer, the message “Transfer aborted by key hit” will be displayed, and the process will be aborted. The control unit will then display the requested function. You can press any key on the second unit, however, without interrupting the transfer process.

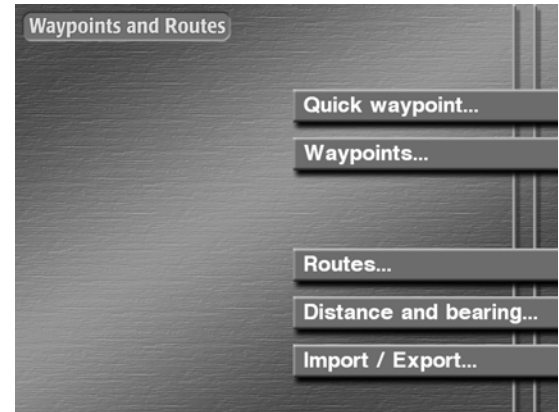
*To intentionally stop the transfer at any time, press the **Stop** key. The control unit will display the message “Transfer aborted by key hit.” Waypoints and routes transferred up to that point are in the receiving unit (be aware that routes may not contain all of their waypoints due to the transfer interruption). Press the **Start** key again to restart the entire transfer process from the beginning.*

1. Choose the unit you'd like to use as the control unit. The instructions below are for a 972.

Remember: You can use either of the two units because both units are capable of importing or exporting waypoints and routes. Make sure the second unit is on.

2. At the control unit, press **WAYPTS/ROUTES**.

3. Press **Import/Export**.



Waypoints and routes screen

4. Decide whether you want to *import* waypoints into the control unit, or *export* them to the second unit.



Import/Export screen

5. Press **Import** or **Export** to display the *import* or *EXPORT* data screen.

The status bar in the center of the screen displays the message “Ready to transfer” to show that the transfer is ready to start.

6. Before transferring, you can check the communication link between the two units by pressing **Test comm.**

The status bar should display the message “Remote link ok.”

7. To move waypoints and routes in the direction you’ve chosen, press **Start**.

The status bar displays the message “Transferring” and shows the number of waypoints and routes already transmitted against the total number. The progress bar, located below the status bar, graphically displays the percentage completed.

If there’s a problem with the transfer process, the following messages may appear:

If the second unit is not ready, the control unit displays “Couldn’t get remote waypt/route count” or “Transfer aborted by communication timeout” and the status-bar message “Communication error.”

If the sending unit doesn’t have any waypoints and routes, the control unit displays the dialog-box message “No waypts or routes to transfer” and the status-bar message “No transfer done.”

If the receiving unit is completely full of waypoints and routes with no more room available, the master unit displays the dialog-box message “Status error [002] database full.”

8. If the transfer is successful, the control unit’s status bar displays the message “*Transfer complete.*”

You can now press any key to resume normal operations.

Notes on waypoint transfer

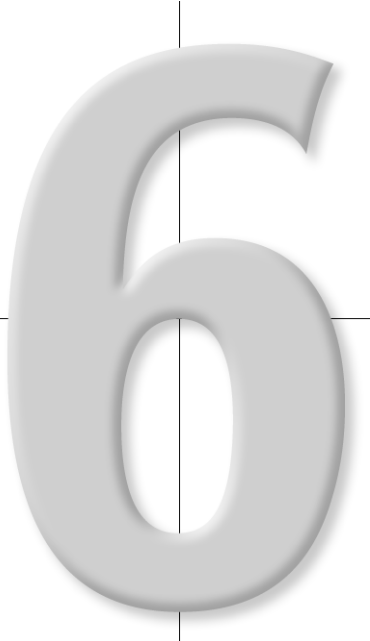
- The user should stop navigating when performing an import on the 972. If the transfer is not initiated from the 972, it will allow the transfer, but cause an error if any of the waypoints in the active route are uploaded.
- Importing from a 961/962 is hidden. If the “96Xexp rt.txt” file is found on any of the removable media, the import function uses that file for transfer.
- Imported waypoints named *SAVEDnn* are converted to (00nn)
- Imported waypoints named (coord) are converted to COORD
- All unrecognizable characters are converted to a space
- Imported waypoints are truncated to 6 characters, and a sequential numeric digit is added to the end to make the imported waypoint unique.

Transferring waypoints to and from a PC

If you've stored many waypoints or routes in the 972, or if these waypoints are the only record you have of these important locations, you may want to keep a separate copy on your Personal Computer.

You can transfer waypoints and routes to your PC using Northstar's loader cable (part number 1100-LC) and the included PC software. Using available third-party software, you can copy, edit or plot your waypoints and routes. Most importantly, you can reload them from your PC into your 972 if they're accidentally erased or lost due to equipment failure. For transfer software and instructions, and cable ordering information, contact your authorized Northstar dealer.

Reference section 6
Radar



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This chapter first describes radar briefly, and then explains how to display, control, and adjust the 972’s radar.

How radar works

The word “radar” is an acronym for “Radio Detecting and Ranging.” A radio transmitter sends out a very short microwave pulse, and then a receiver listens for that signal’s echo when it’s bounced back from a target in its path. Targets, which may be other boats or ships, navigational markers, flocks of birds, or land masses, are displayed on the 972’s screen. By knowing

how long it takes for a signal to return, the distance to a target can be determined. As the radar antenna scans through a 360-degree rotation, it shows the target’s location relative to your position. By watching repeated scans of a target, such as another vessel, you can see how that target is moving.

Turning the radar transmitter on and off

Each time you turn on the Northstar 972, the radar transmitter must be turned on separately, as a safety feature.

To turn the transmitter on or off:

1. Press **RADAR** to display the radar screen.
2. Press **Transmit** so it indicates **On** or **Standby**, as desired.

Displaying radar

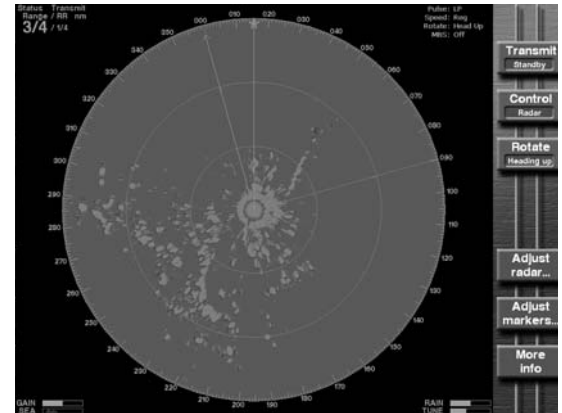
The radar image includes:

- a compass rose to show the direction of true or magnetic north
- a gray heading line. This line indicates your heading, not Course-Over-Ground, and can be used to compare the radar presentation with the view in front of the vessel.
- in the upper left corner, the transmit status (*Transmit on* or *Transmit standby*), and the current radar scale (**Range** indicates the distance from the center to the largest range ring, and **RR** indicates the spacing between the range rings)
- in the upper right corner, pulse length, speed setting, rotation mode and Main Bang Suppression (MBS)

- in the lower right corner, rain clutter and tuning indicators
- in the lower left corner, gain and sea clutter indicators

For information about rotating and scaling the radar, see *Changing radar scale and rotation*, starting on page 90.

A demo mode for radar can be activated from the *Chart Options* screen. Press **Demo control** and then **Radar demo**. The radar demo position is located in the Fort Lauderdale area.

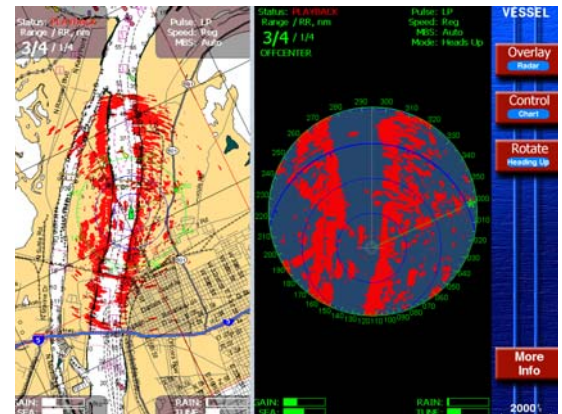


Radar screen

Using the radar's main menu keys

The radar's main menu keys allow you to:

- turn the transmitter on or off
- switch control between the radar and chart (if the chart is also displayed)
- rotate the radar image
- access the radar adjustments
- access the radar markers
- show more navigation information on the info bar at the bottom of the screen



Radar screen (split)

Transmitter control

When the radar image is displayed full-screen by pressing the **RADAR** key, a menu key allows you to set the radar transmitter to *Standby* or *On*.

Controlling radar

In order to control the radar from the menu keys, the **Control** key (if displayed) must indicate *Radar*.

If necessary, press the **Control** key repeatedly until it indicates *Radar*.

Rotating the radar image

Press **Rotate** repeatedly to choose the screen rotation. You can choose north up, course-up, heading-up, or leg-up. For more information, see *Changing radar scale and rotation*, on page 90.

Adjusting the radar

Press the **Adjust radar...** key to access several pages of radar adjustments. For more information about using these keys, see *Using the Adjustment keys*, on page 91.

Using the radar markers

Press **Adjust Markers...** to display the controls for the 972's electronic bearing line (EBL), variable range marker (VRM), and guard zone. For more information about using these keys, see *Using the Markers keys*, starting on page 94.

Viewing more info

Press **More info** to display an "info bar" at the bottom of the screen. Each additional press of **More info** shows the following information:

- your vessel's present Speed-Over-Ground (*SOG*), Course-Over-Ground (*COG*), and heading (*HDG*)
- your vessel's distance (*dist*) and bearing (*brg*) to the current waypoint, if any, along with a steering indicator
- your vessel's position in lat/lon (or TDs, if enabled)
- tide and current information

Overlaying radar on the chart

To overlay radar onto the chart, press **CHART** to switch to the chart screen, then press **Overlay** to display *Radar* in the key's blue box.

Radar can be displayed on the main radar screen, or as an overlay on the chart

screen, or as part of a split screen. All radar functions are controlled in the same way, regardless of how radar is displayed. Just press the **Control** key so that it displays *Radar*.

Changing radar scale and rotation

To use radar features when radar is overlaid on the chart or displayed as a split screen, be sure to press **Control** if necessary so that the button indicates *Radar*

Changing the scale

To change the radar's scale, press the **IN** key to zoom in (smaller area, more detail) or the **OUT** key to zoom out (wider area, less detail).

Using zoom on a split screen

If there's no radar overlay on the chart, the chart and radar are scaled separately. Zooming in on the chart, for example, has no effect on the radar's scale. If the **Control** key indicates *Radar*, you're zooming the

radar; if it indicates *Chart*, you're zooming the chart.

However, if the radar overlay is turned on, the chart and radar scales are locked together. When you zoom in on the chart, radar scale changes to match the chart.

Rotating the radar image

To rotate the radar image, press the **ROTATE** key repeatedly until it indicates the rotation you want. You have the same options as for a *Chart* screen: North Up, Course Up, Leg Up or Heading Up (see *Rotating the chart*, starting on page 31).

The rotation of the chart and the rotation of the radar interact under certain circumstances, as described in the table below. If the **Control** key indicates *Radar*, you're

rotating the radar; if it indicates *Chart*, you're rotating the chart.

Range rings

Range rings are concentric circles around your vessel that can be used to measure

distance from your vessel. The spacing of the range rings is shown in the upper left-hand corner of the radar image (identified by "**RR**."

Range rings can be turned off when they are not needed.

Using the Adjustment keys

Press **Adjust radar...** to display a menu accessing several pages of radar adjustments. Most of these adjustments correspond to conventional radar adjustments and are used in the same way. All settings are retained while the system is turned off.

The adjustment pages are:

- Image
- Advanced settings
- Presets
- Setup

Using the keys

A radar menu key on these screens must be activated by pressing it once to change the key from blue to red. (Any key that is red is active and will respond immediately.

A blue key must first be pressed to activate it.)

For keys with an *Auto* and *Manual* setting, press the menu a second time to change this setting.

To enter a number, use the keypad to enter the digits or use the cursor pad to step the digits up or down.

To make an adjustment to the radar (such as rain clutter, or gain, etc.), use the following procedure:

1. Press the key (such as **Gain**) to activate it (the key changes from blue to red).
2. Press the key again, if necessary to select *Auto* or *Manual*.
3. If a numerical value appears, you can change it by:
 - pressing the cursor pad up and down (changes affect the display

- immediately after the cursor pad is released), or
- using the numeric keys on the keypad to enter the value

Image adjustments

Press the keys to adjust the gain, sea clutter, rain clutter, or interference rejection.

When pressed, the keys turn red to indicate it is active and its value can be adjusted.

Range Rider is a Northstar exclusive feature, strongly recommended when manual settings are required. The user can freely make any needed gain and clutter adjustments, and these settings are “remembered” for each range. When the range is selected again, the last-used gain and clutter settings for that range is reapplied. **Range Rider** can be selected on the *Radar Options* screen.

Gain controls the strength of all echoes, and should be adjusted for a pleasing and useful image. Higher values display brighter echoes.

Gain can be set to automatic or manual mode. Press the activated **Gain** key to switch modes. The gain setting can be entered on the keypad or by using the cursor pad. Manual settings range from 0

to 99. Manual gain adjustments will be different for each range scale. Longer ranges generally require more gain.

If speckling appears on the screen, you may wish to decrease the gain a bit or increase the sea clutter setting.

Sea Clutter controls the strength of the clutter echoes returned from the ocean surface. Higher values suppress more clutter.

Sea Clutter can be set to automatic or manual mode. Press the activated **Sea clutter** key to switch modes. The sea clutter setting can be entered on the keypad or by using the cursor pad. Manual settings range from 0 to 99.

Rain Clutter controls the strength of the clutter echoes returned from rain or fog. Higher values suppress more clutter.

Press the activated **Rain clutter** key to switch modes. The rain clutter setting can be entered on the keypad or by using the cursor pad. Manual settings range from 0 to 99.

Interference rejection. Certain types of interference (for example, from radars on other vessels) can be lessened by using the interference rejection filter. Select Off, 1 (low), 2 (medium), or 3 (high).

Manual vs. automatic settings

When gain or sea clutter is in manual mode, the same setting is applied at all directions from the vessel. In automatic mode, settings are calculated scan line by scan line. This provides the advantage that the settings can be optimized for each direction. For example, with a breeze, sea clutter is typically stronger when looking into the wind than when looking away from it. The radar can automatically suppress more sea clutter where it is needed, and allow more signal to be displayed in areas with less clutter return.

Advanced settings

Press the following keys to adjust the pulse length, signal expansion, speed and position offset.

Pulse

Select **Long** for better penetration through rain and fog. Select **Short** for better discrimination of small targets.

Expand

Select **On** to make small echoes appear larger. Select **Off** for normal operation.

Speed

Select **Normal** for normal antenna rotation speed (24 r.p.m). Select **Fast** for quicker rotation (48 r.p.m.)

NOTE

For 4kW Dome radars, you must switch the radar to Standby mode and then back to Transmit when this setting is changed.

For all other radars, this feature is only available on 24VDC systems.

Offset

Select **Center** to position the vessel in the center of the screen. Select **Look ahead** to display more area in front of the vessel.

Presets

There are two types of presets – for automatic and for manual settings.

Manual presets

To set the manual presets, first return to the Image page, described above, and set Gain and Sea Clutter to *Manual*.

These presets set the minimum value for the manual settings, so that the manual adjustment covers the entire useful range

Set the control (for example, gain) to a mid-range value (such as 30), and then

adjust the gain preset to produce a good-looking image.

Automatic presets

To set the automatic presets, first return to the Image page described above, and set Gain and Sea Clutter to *Automatic*.

Gain preset

Set this control for a pleasing looking image. The unit will attempt to maintain this appearance.

Sea preset

Set this control for a pleasing looking image. The unit will attempt to maintain this appearance.

Sea clutter preset can be adjusted for *harbor* mode (for when the range is set to less than 1nm, or for *auto* mode (for when the range is set to greater than 1 mile).

Auto tuning

STC curve

The STC curve controls how the sea clutter function decreases the gain near the vessel.

Setup...

See the radar installation manual (P/N GMEKRadIM) for using these controls. Under normal circumstances these controls will not be used for day-to-day operation. They are set once during the initial installation and should not be changed except during maintenance of the system.

Trigger delay

Heading calib

Park angle

Using the Markers keys

Press **Adjust Markers** to display controls for the 972's electronic bearing line (EBL), variable range marker (VRM), and guard zone.

Press **EBL**, **VRM** or **GuardZone** to access that function. Press **Visibility** to make the selected function visible or invisible.

When finished, press **Return** to return to the main radar menu keys. All settings are retained while the system is turned off.

Electronic Bearing Line (EBL)

The Electronic Bearing Line is a marker that you can place on top of the radar image to aid in navigation and to keep track of your surroundings.

Use the cursor pad to move the EBL around your position to measure the bearing to any object on the screen.

Variable Range Marker (VRM)

The Variable Range Marker is displayed as a circle around your vessel. Use the cursor pad to make the circle bigger or smaller. The distance to the marker is displayed in the lower left corner of the screen.

Guard zone

Press the **Guard Zone** menu key to control this feature. Echoes detected inside the guard zone will cause an alarm.

The guard zone is bounded by red lines — an inner and an outer arc centered on the vessel, and two straight lines extending outward from the vessel. The interior of the guard zone is yellow.

You can turn visibility of the zone on or off, and change its boundaries.

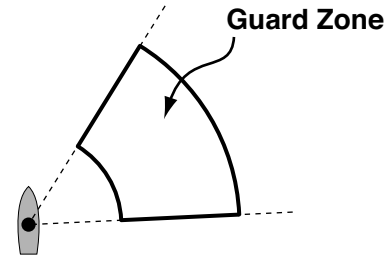


Figure 4: Guard zone

Press the following keys to adjust each guard zone.

Press **Visibility** to show or hide the guard zone. When the zone is hidden, it doesn't alarm.

To adjust the position of the guard zone, press **GuardZone** (if necessary) so that it displays *Position*. Use the cursor pad to set the position.

To adjust the size of the guard zone, press **GuardZone** (if necessary) so that it displays *Size*. Use the cursor pad to set its size.

Radar cursor

If you press the cursor pad while on the radar screen, a radar cursor is displayed. You can move the cursor to any echo or other point on the screen and read the

distance and bearing to it in the lower right corner of the screen.

Press **Vessel** to remove the radar cursor when done.

MARPA targets

The Miniature Automatic Radar Plotting Aid (MARPA) target tracking system allows you to designate displayed echoes as *targets*, which will be tracked automatically as they move. Each target's speed, course-over-ground, closest point of approach, etc. are calculated and displayed. Targets are displayed on the radar image with special symbols indicating their acquisition status.

You can control how much data is displayed for each target.

MARPA is used primarily for collision avoidance in larger ships at ranges from about 2 to 8 nautical miles, and in smaller ships at ranges between 1/2 and 4 nautical miles.

How does MARPA work?

MARPA works by continuously assessing a target you have designated. As the vessel pitches and rolls with the sea, the radar's view, the target's shape and size, and the ship's heading will all vary. If you can't see the target on the radar, then the MARPA feature can't see it either.

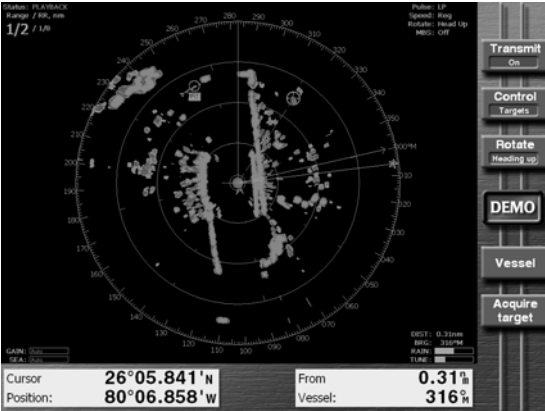
The 972 has built-in intelligence that compensates for all this variation and makes every attempt to track MARPA targets – even in difficult conditions.

A critical component in the operation of the MARPA feature is your heading sensor. The heading sensor provides MARPA with critical information to correlate the radar display with the ship's heading. A poor heading sensor can make MARPA a challenge even in good conditions.





Designating targets

To designate a MARPA target on the radar screen, set the **Control** menu key to *Targets*. Use the cursor pad to move the cursor over the target, and finally press **Acquire target**.

The 972 will attempt to lock on to the target and begin tracking it. A maximum of ten targets can be tracked at once

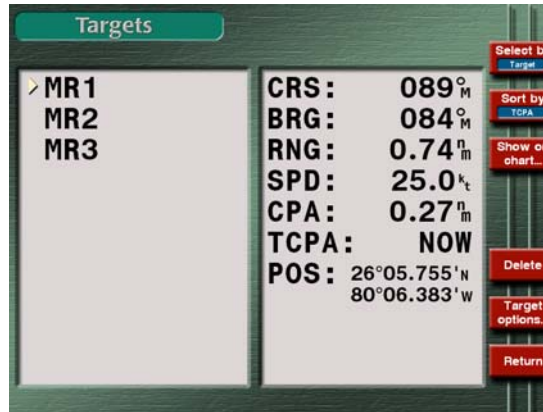


Each target being tracked will be indicated by a symbol placed over the target. A list of symbols and their meanings is shown below. The symbols follow the targets for as long as they can be tracked by the 972.

Symbol	Symbol name	Symbol definition
	Dashed box	Radar is attempting to acquire the target as a MARPA target. This typically takes up to several full rotations of the radar antenna array.
	Blue circle with vector	Normal target. Vector shows course and speed of the target.
	Red triangle with vector	Threat target. The target is inside the radar alarm area. Vector shows course and speed of the target.
	Yellow diamond	Lost target. The radar has lost the target and is attempting to reacquire it.

The Targets screen

To display information about the targets, press the **Control** key until you see *Targets* in the blue tab. Then press the **Targets...** menu key.



The tracked target names are shown in the left panel. Use the cursor pad to select a particular target. Information about the selected target is shown in the right panel. The following information is shown:

- CRS – the direction of travel of the target
- BRG – the direction from your vessel to the target
- RNG – the distance from your vessel to the target

- SPD – the speed of the target
- CPA – the calculated Closest Point of Approach (how close the target might come to your vessel, based on current courses and speeds)
- TCPA – Time to Closest Point of Approach (how soon the target will reach the CPA)
- POS – the position coordinates of the target, as lat/lon or phantom loran TDs

Target controls

Select by

Targets may change their positions in the list as then move relative to the vessel. To keep the same target selected at all times, choose **Select by Target**. To keep the same position in the list selected at all times (for example, the closest target), choose **Select by Position**.

Sort by

The target list may be shown in order of target distance (range), Threat level, CPA or TCPA.

Show on chart...

Press this menu key to switch to the *Chart* screen with the selected target centered on the screen.

Delete

Press to delete the target from the list.

Target options...

Press to display the *Target Options* screen.



Target options screen

The *Target Options* screen controls how target data is displayed, and how the target alarm works.

Detail

Choose the data that labels the target on the radar image:

- name of the target
- name and the target's COG and SOG
- name and the target's CPA and TCPA
- all data
- none

Generally, you may wish to display only the target name, to avoid cluttering the screen and covering the display of other radar echoes.

Tracks

Targets can leave tracks showing their previous positions and their motion. Choose the length of the tracks from 1 minute to 15 minutes, or turn them off.

Sorting

Choose how the targets list is sorted (same as the menu key on the *Targets* screen).

Bearing

Choose whether bearings are displayed as relative to the vessel's heading, or as absolute bearings (north = 000°), or as a clock dial ("target at 4 o'clock")

Alarm

Turn the target alarm function on or off.

Range

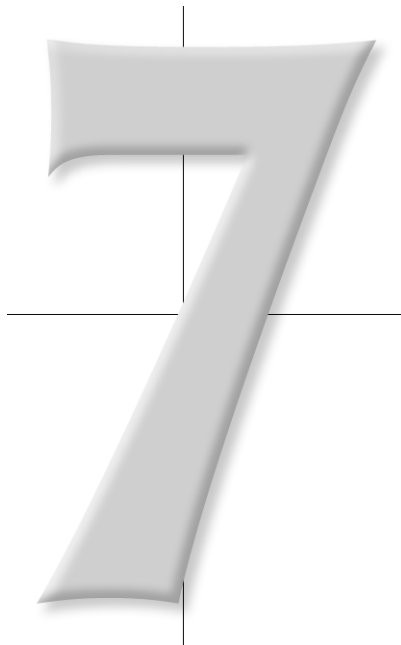
Set the distance of the range alarm, and turn it on or off.

CPA

Set the distance of the CPA alarm and turn it on or off.

TCPA

Set the time of the TCPA alarm.



Reference section 7

Echo sounding

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Echo sounding alarms 121

The Northstar Echo Sounder connects with the Northstar 972 and a transducer to add echo sounding capability to the system. See the *Northstar 491 Installation Manual* or the Airmar website (www.airmar.com) for recommended transducers.

Welcome to the Northstar Echo Sounder

CAUTION!



Proper installation and configuration of your Northstar sounder is of utmost importance for accurate and effective performance under a variety of conditions. To get the best performance, Northstar strongly recommends installation and set-up be performed by a qualified marine technician. For installation procedures, see the Northstar Echo Sounder Installation Manual (Part Number GM491).

How echo sounding works

An echo sounder produces high-voltage electrical pulses (called “pings”) that the transducer converts into sound waves. When a sound wave hits and reflects off an object, such as fish, debris, seaweed, or the seabed, the reflected sound wave (an “echo”) returns back to the transducer along an imaginary vertical line called a “water column.” The transducer converts this echo into a tiny electrical pulse. The sounder digitizes these pulses and sends them to the navigator, so that echo sounding pictures of the water and seabed can be displayed and analyzed on the echo

sounder screen. The echo sounding system lets you see a real-time cross section of what’s happening underneath your vessel.

The 491 module automatically turns on and off as the 972 is turned on and off. There is a 20-second delay after the 972 turns off before the 491 turns off.

Setting up the sounder

Your sounder should be installed by a qualified marine technician. Your satisfaction with the system’s performance will be greatly influenced by the practical knowledge and experience of the installer. Unlike GPS or other marine electronics systems, echo sounder installation is as much an art as it is a science.

The installation procedure includes setting the 972’s AUX port to the sounder option, and then setting the following options. Once properly set, they should not be adjusted further.

- the transducer’s depth
- the speed and temperature
- the calibration for the speed sensor
- the calibration for the temperature sensor
- the gain calibration for the transducer

You may wish to change the following options from time to time to match your personal preferences:

- depth units (feet, meters, or fathoms) on the screen
- temperature units (Celsius or Fahrenheit) on the screen
- temperature graph scale (lowest and highest) on the screen

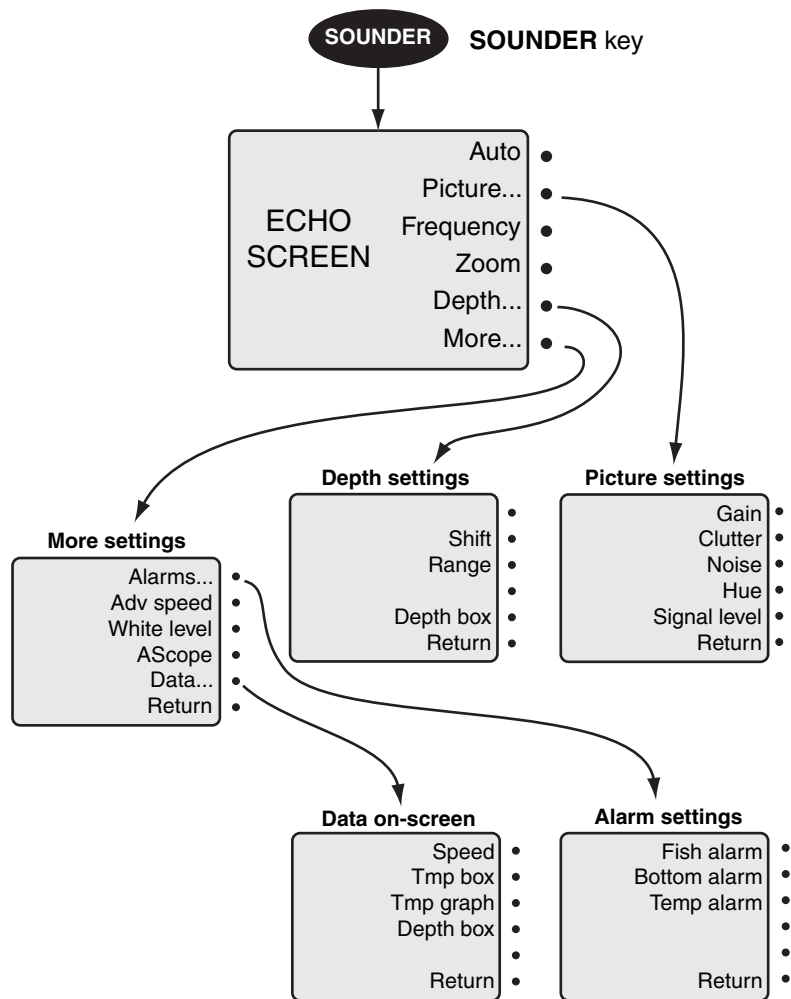


Figure 5: Echo sounder menu structure

Displaying the echo sounder's picture

To see the echo sounding screen at any time, press **SOUNDER**. You'll see live echoes moving across the screen.

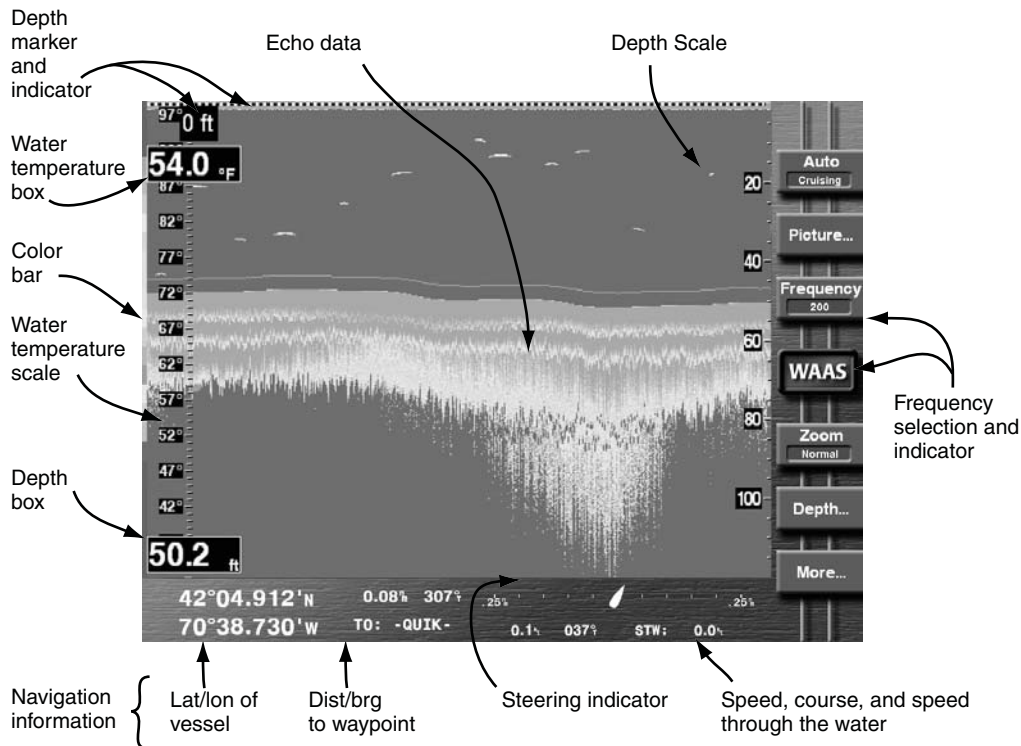


Figure 6: Illustrated SOUNDER screen

You can also review old echoes using Northstar's exclusive SoundTrac™ feature.

For details, see *Viewing past echoes using SoundTrac*, on page 120.

Using demo mode

The echo sounder can be operated in “demo mode” for training and familiariza-

tion. Simulated echo data generated by the sounder will be displayed.

The sounder demo mode is activated by turning on the chart demo mode.

Using automatic mode

To operate the echo sounder automatically, just press **Auto**. All of the sounder’s adjustments will be set to produce a useful picture under most conditions. When you’re too busy to optimize the settings manually, the echo sounder can automatically set the optimal gain, clutter, and range settings, to show an excellent picture from the surface to the bottom.

When you select Auto, the range setting may change from time to time to keep the seabed in view as the water depth changes.

It is recommended that the sounder be operated automatically whenever possible. The sounder can reliably detect the seabed depth only when it controls the gain and clutter settings.

Cruising or fishing

Automatic mode has two variations: *Cruising* and *Fishing*.

- auto cruising optimizes the gain and clutter for tracking the bottom, with less emphasis on any fish in the water
- auto fishing optimizes the gain and clutter for searching for fish

Press **Auto** to switch between auto cruising and auto fishing. The setting is shown on the menu key.

Manually overriding automatic mode

You can always manually change any of the echo sounder’s settings: the gain, clutter, noise limiter, shift, and range. (Manually setting the gain causes the range to be controlled manually.)

Changing the appearance of the picture (colors, gain, clutter, and the noise limiter) is described in *The picture menu*, starting on page 114.

Setting the range and shift is described in *Changing the depth settings*, starting on page 116.

Changing the frequency of echoes

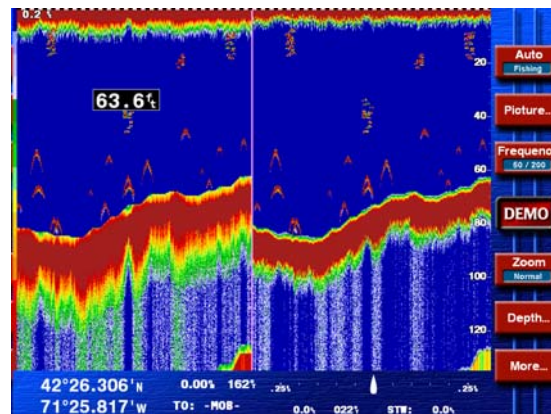
The sounder uses two transducer frequencies: 50 kHz and 200 kHz. The advantages and disadvantages of each frequency are shown below.

Table 2: 50 kHz vs. 200 kHz

50 kHz	200 kHz
Longer wavelength goes deeper, but with somewhat lower resolution.	Shorter wavelength provides a sharper picture, but can't go as deep.
Less resolution is better at finding big fish, but may miss the bait fish.	Finer resolution is better at finding small fish (baitfish) and subtle bottom details.
Wider beam is good for seeing fish not directly beneath the boat.	Narrower beam is very focused. Reduces the influence of a rough sea.

You can choose from four settings for the transducer frequency:

- 50 kHz displayed on a full screen
- 200 kHz displayed on a full screen
- 50 kHz on the left half of the screen, and 200 on the right
- 200 kHz on the left half of the screen, and 50 on the right



50 and 200kHz displayed

There are two reasons why you might want to operate with your preferred frequency on the *right* side of the screen:

- the zoom function magnifies the frequency on the right side
- when adjusting the picture, you can see the effect of changes on the right side

To choose the transducer frequency, press **Frequency** until the desired combination is shown.

When you change the frequency, echoes already on the screen don't change, they just move off the screen as they are replaced by echoes at the new frequency.

A dual-frequency screen is split into two halves separated by a vertical line in the center.

When using the zoom feature (which also splits the screen into halves), both sides of the screen always display the *same* frequency.

Zooming in and out

The echo sounder's zoom feature expands a portion of the echoes. You can examine closely any part of the water column to determine the composition of the bottom or look at the echoes of fish, rocks, or wrecks. When fishing, the zoom function is useful for showing a detailed view of any echoes below the vessel.

Choosing a zoom mode

Press the **Zoom** menu key on the *Echo Sounder* screen to cycle through the four zoom modes (or turn the zoom feature off):

- bottom zoom
- bottom lock
- bottom lock/center
- marker zoom

The current zoom mode is displayed on the **Zoom** key.

For all zoom modes, the original unzoomed echoes are on the right side, and the

magnified area is shown on the left side of the screen.

Choosing the zoom scale

Press **IN** to zoom in and increase the magnification of the echoes you see below the top edge of the marker. Press **OUT** to zoom out and increase the amount of water seen.

Six depth ranges are available for the magnified echoes: 15', 30', 60', 120', 240' and 480'. Similar scales are available for the other depth units.

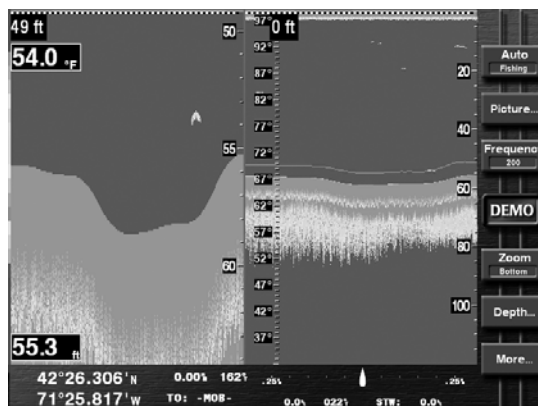
When zoom is in use, only a single frequency is displayed. Unzoomed echoes are on the right, and the same frequency is shown magnified on the left.

You cannot zoom out to a scale that shows more water than the original picture. For example, if the original picture is set to a scale of 50 feet, the only zoom scales available will be 15 feet and 30 feet.

Bottom zoom

When you select *bottom zoom*, the contour of the bottom is magnified, clearly displaying canyon edges and echoes near the seabed. The sounder automatically locates the seabed and displays it on the lower left side of the screen (normal echoes are displayed on the right side).

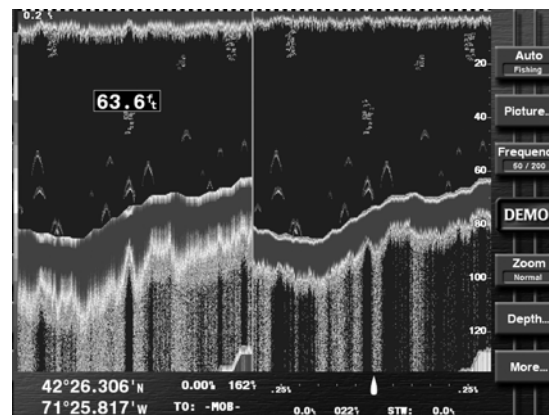
If the seabed moves out of the lower half of the screen (for example, if you travel into deeper water), the sounder automatically repositions the bottom back into the lower half. You'll see the zoomed image jump up or down from time to time, as the sounder keeps the seabed displayed on the screen.



Bottom zoom

Bottom lock zoom

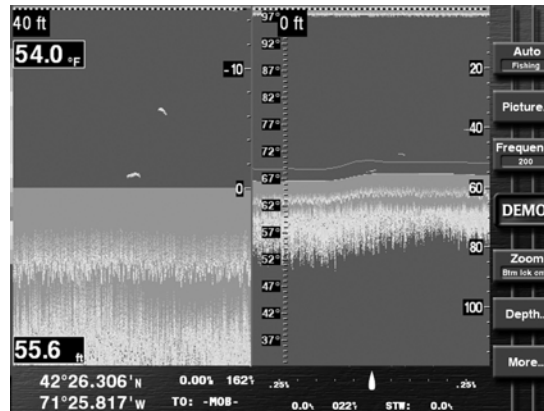
Bottom lock zoom is similar to bottom zoom, except the magnified sea bottom is flattened-out and displayed on the left side of the screen at the lower edge. You can see any fish that are swimming near the bottom.



Bottom lock zoom

Bottom lock/center zoom

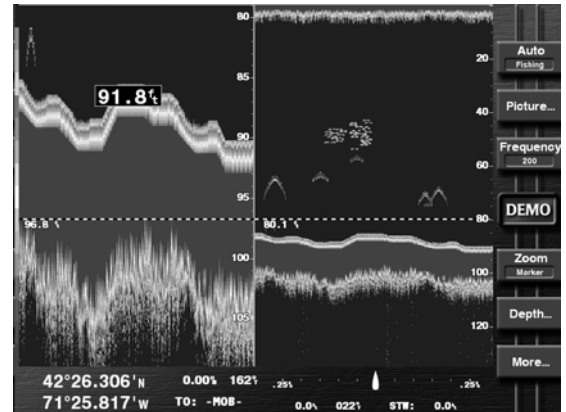
When you select *bottom lock/center zoom*, the flattened-out sea bottom is displayed in the center of the screen. You can see any fish near the bottom – as with the bottom lock zoom – and also examine the seabed's composition.



Bottom lock/center zoom

Marker zoom

When you select *marker zoom*, you can choose the part of the water column to magnify. The top edge of the magnified area is determined by the location of the depth marker. To move the depth marker, press the cursor pad up or down.



Marker zoom

Leaving zoom mode

To return to the normal unzoomed display, just press **Zoom** repeatedly until you have cycled through all the zoom modes.

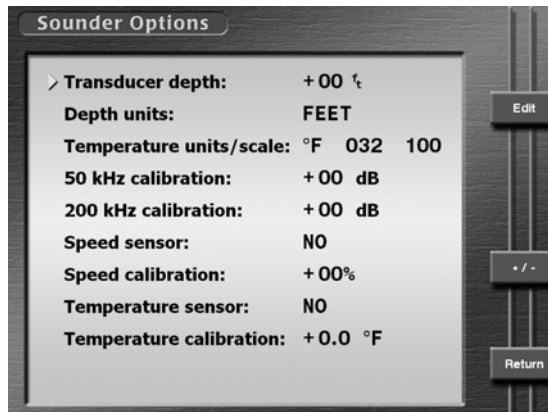
Echo Sounder setup

Several setup functions are available to configure the echo sounder.

CAUTION:

Be careful not to change any of the functions that are not described here unless you first read about them and understand their functions in the Installation Manual.

Accessing the setup screen



Echo Sounder Setup screen

To display the echo sounder setup screen, press the **STAR** key to display the *Options/Service Info* screen, and then press **Sounder Options**.

Or

From the *Sounder* screen, press and hold the **SOUNDER** key to display the *Options/Service Info* screen, and then press **Sounder Options**.

Transducer depth

This option specifies how far below the surface of the water the transducer is mounted. The number is added to all depths measured by the sounder so they will refer to depth from the surface, not from the transducer. This value should have been set correctly during installation and should not be changed.

Depth units

You can change the depth units to feet, meters, or fathoms:

1. Press the Cursor pad up or down to highlight the *Depth Units* option.
2. Press **Edit**.
3. Press the Cursor pad up or down to display the desired units.
4. Press **ENTER**.

The temperature graph's units and scale

You can change the highest and lowest water temperatures that will be displayed on the temperature graph (settings can range from 32°F to 100°F):

1. Press the Cursor pad up or down to highlight the temperature scale option.
2. Press **Edit**.
3. Press the Cursor pad up or down to highlight °C or °F, as desired.
4. To change the endpoints of the scale, press the CURSOR PAD to the right.
5. Enter two digits for the lower temperature limit using the keypad.
6. Enter two digits for the upper limit.
7. Press **ENTER**.

Transducer calibrations

These functions are set during installation and should not be changed unless they are known to need adjustment.

The 50 kHz and 200kHz calibrations are used to equalize the signal strengths of the two frequencies.

Demo mode

To activate Demo mode, see *Using demo mode*, on page 107.

Speed and temperature sensor setup

These functions are set during installation and should not be changed unless they are known to need adjustment.

To simplify operation, the “sensor installed” options can be set to “No” to remove all references to temperature and speed from all the screens.

Highlight the appropriate line and press **Edit** to change the option.

Speed calibration is entered as a percentage from –99% to +99% to make the speed read lower or higher than the uncalibrated value.

NOTE:

*You **must** enable the speed setting under the Data menu on the Echo Sounder screen.*

Temperature is calibrated by entering the temperature error as a number of degrees from –9.9 to +9.9. This offset is added to the uncalibrated temperature before it is displayed or graphed.

The picture menu

You can adjust the appearance of echoes in five different ways:

- gain (for high intensity echoes)
- clutter (for low intensity echoes)
- noise limiter (for interference)
- hue (to choose colors and white level)
- signal level (to remove weak echoes)

Gain and clutter changes are applied only to new echoes as they appear on the right side of the screen – earlier echoes are not affected.

Adjusting the gain (strong echoes)

The *gain* setting selects the echo strengths that will be displayed using the *topmost* color in the color bar at the left edge of the screen (the *strongest* echoes).

Any echoes stronger than this selection will use the same color and no detail can be distinguished. The gain is usually set so that strong seabed echoes are displayed in brown, the strongest level.

The gain can be also be set automatically by pressing **Auto**. This provides an excellent picture under most conditions, and allows the sounder to reliably detect the seabed depth.

Gain is normally adjusted together with *clutter*, as described on the next page.

To adjust the gain:

1. At the *Echo Sounder* screen, press **Picture**.
2. Press **Gain**.
3. Press the cursor pad up or down to adjust the gain, or use the keypad to manually enter the desired gain value. The available settings range from zero (minimum) to 75 (maximum).
4. Press **Return** to go back to the *Echo Sounder* screen.

Adjusting the clutter (weak echoes)

The *clutter* setting selects the echo strength that will be displayed using the *bottom* colors of the color bar (the *weaker* echoes).

Any echoes weaker than this selection are not displayed. If you select a clutter value of 5, for example, all weak and moderate echoes are suppressed. You might choose this setting to eliminate high levels of background noise and echoes from turbulence or plankton.

A setting of 0 allows all echoes to be displayed.

To adjust the clutter:

1. At the *Echo Sounder* screen, press **Picture**.

2. Press **Clutter**.
3. Press the cursor pad up or down to adjust the clutter, or use the keypad to manually enter the desired clutter value. The available settings range from zero (shows all echoes) to nine (suppresses many echoes).
4. Press **Return** to go back to the *Echo Sounder* screen.

Adjusting the signal level (weak echoes)

As with the **Clutter** key, the **Signal level** key controls the appearance of low level noise in the picture. Whereas clutter compresses or expands the available colors to fit the desired signal range, Signal Level completely removes the weaker colors and their echoes.

To adjust the signal level:

1. On the *Echo Sounder* screen, press **Picture**.
2. Press **Signal level**.
3. Press the cursor pad up or down to remove the weaker color levels from the picture, or use the keypad to manually enter the desired signal level.

The available settings range from 1 (minimum) to 5 (maximum). For example, if you select a signal level of 3, echo strengths of 0 through 3 are all displayed using the same color as the background.

4. Press **Return** to go back to the *Echo Sounder* screen.

Suppressing interference (the noise limiter)

The *noise limiter* reduces the adverse effects of interference caused by other nearby echo sounders or electronic devices. However, the noise limiter may cause some very weak echoes to be made smaller or be entirely eliminated, since it removes any echoes that aren't sustained for at least two pings.

To turn on the noise limiter:

1. At the *Echo Sounder* screen, press **Picture**.
2. Press **Noise** to turn the limiter on or off.
3. Press the **Return** key to go back to the *Echo Sounder* screen.

Selecting the color bar (hue) and white level

The *color bar* displayed at the extreme left of the *Echo Sounder* screen shows the range of colors used to display various echo strengths. Weaker echoes are displayed with colors near the bottom of the scale, and stronger echoes are displayed with colors near the top.

You can choose any one of nine palettes of colors to represent the echo strengths from weakest to strongest.

- Color bar #1 is the one most often used.

- Color bar #2 is similar but with fewer colors, to aid visibility under some conditions.
- Color bars #3-8 are additional variations with different background colors.
- Color bar #9 uses a monochrome scale, ranging from dark to bright.

Selecting the color bar (hue)

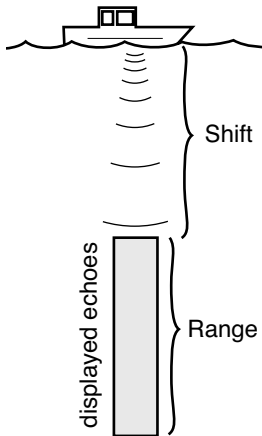
To select the color bar:

1. On the *Echo Sounder* screen, press **Picture**.
2. Press **Hue**.
3. Press the cursor pad up or down to select the color bar desired, or use the keypad to manually enter the number of the color bar.
4. Press **Return** to go back to the *Echo Sounder* screen.

Changing the depth settings

You can adjust the shallowest and deepest echoes to be shown on the *Echo Sounder* screen. In automatic mode, the echo sounder sets these values based on its current environment. However, you can manually override these auto values for your specific needs at any time. There are two depth settings:

- shift (how far below the surface the echo sounder picture starts)
- range (the depth covered by the echo sounder picture from the top of the screen to the bottom of the screen)



Setting the picture's shift (starting depth)

The *shift* setting adjusts the depth of the top edge of echoes pictured on the *Echo Sounder* screen. You can “shift” the entire picture up and down to start at the surface of the water, 20 feet down, or any other depth you choose.

To set the shift value:

1. At the *Echo Sounder* screen, press **Depth**.
2. Press **Shift**.

*Press the cursor pad up or down to shift the starting depth, or use the keypad to enter the digits of the desired depth (press **ENTER** when done).*

3. Press **Return** to go back to the *Echo Sounder* screen.

Setting the picture's range

The *range* setting adjusts the overall depth covered by the echo sounder picture, from the top of its display to the bottom. The range can be set automatically (by pressing **Auto**), or manually.

To set the range:

1. Press **Depth**.
2. Press **Range**.
3. Press the cursor pad up or down to adjust the range, or use the keypad to manually enter the desired range (*press **ENTER** when done*).
4. Press **Return** to go back to the *Echo Sounder* screen.

Viewing the seabed depth

The seabed depth (the “bottom”) is displayed numerically in a black box at the left edge of the *echo* screen.

You can change the size and location of the depth box:

1. Press **Depth**.
2. To cycle through the size choices, repeatedly press **Depth box**. To move the box up and down, press the cursor pad.
3. Press **Return** to go back to the *Echo Sounder* screen.

*The depth box can also be adjusted by pressing **More**, then pressing **Data**.*

Using the depth marker

You can use the *depth marker* to accurately measure the depth of an echo. To display the depth marker – a dashed horizontal line – and move this marker up or down, press the cursor pad down on the main echo screen. Small digits attached to the depth marker line display the marker's exact depth.

The depth marker also affects the Marker Zoom display (see *Marker zoom*, on page 111).

Using the MORE key

Pressing the **MORE** key accesses the following functions:

- alarms (described beginning on page 131)
- advance speed
- A-scope
- data (numeric and graphic information on the *Echo Sounder* screen)

Changing the advance speed

Advance speed refers to the speed at which the vertical scan lines move from right to left across the *Echo Sounder* screen. There are five advance speeds (plus the *Off* setting, which freezes the advance of all data):

- 2/1 - two identical lines of data are displayed for every ping
- 1/1 - one line of data is displayed for every ping
- 1/2 - one line of data is displayed for every two pings
- 1/4 - one line of data is displayed for every four pings
- 1/8 - one line of data is displayed for every eight pings

For speeds 1/2, 1/4, and 1/8, each displayed line of data is the average of 2, 4, or 8 pings, respectively.

To set the advance speed:

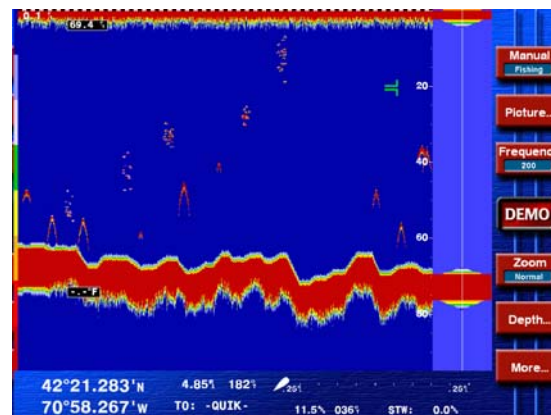
1. At the *Echo Sounder* screen, press **More**, then press **Adv spd**.
2. Keep pressing **Adv spd** to select the desired advance speed.
3. Press **Return** to go back to the *Echo Sounder* screen.

Displaying the A-scope

The echo sounder's *A-scope* lets you look closely at present or past echoes by horizontally magnifying the echo from each ping.

To display the A-scope:

1. Press **More**.
2. Press **AScope** to turn the A-Scope on or off.



A-scope

The A-scope appears on the far right-hand side of the screen, magnifying one water column.

The A-scope with dual frequencies

If you're displaying both 50 and 200 kHz echoes, the A-scope magnifies echoes from the frequency shown on the right side of the screen.

The A-scope with zoom mode

If you're in zoom mode, the A-scope magnifies the unzoomed echoes on the right side of the screen.

Setting the ECHO screen data

Numeric and graphic information can be displayed on top of the echoes, including bottom depth, water temperature, and speed through the water (STW).

To access these functions, press **More**, and then **Data**.

Note that the temperature and speed menu keys don't appear if the sensors are not configured. Sounder configuration settings are found on the Sounder Options screen (see *Echo Sounder setup*, starting on page 112.)

Speed through the water

Press **Speed** to turn the Speed Through the Water display on or off. STW is displayed on the bottom right corner of the screen.

Temperature box

Press the **Tmp box** key to set the size and location of the box displaying the water

temperature (white numbers on a black background).

Press this key again to cycle through the available sizes: off, small, medium, large, and huge.

Temperature graph

Press **Tmp graph** to turn the temperature graph on or off.

The temperature graph displays a temperature scale at the left of the screen, and an orange line tracing out the varying water temperature measurements, superimposed on the echoes.

Bottom depth box

Press **Depth box** to set the size and location of the box displaying the bottom depth (white numbers on a black background).

Press this key again to cycle through the available sizes: small, medium, large, and huge.

Press the cursor pad up and down to set the position of the box along the left edge of the screen.

Press the cursor pad up and down to set the position of the box along the left edge of the screen.

Viewing past echoes using SoundTrac

On the *SoundTrac* screen, you can use Northstar's exclusive SoundTrac feature to look back and examine past echo data.

To enable SoundTrac:

1. At the main *Echo Sounder* screen, press the cursor pad to the left.
The position marker — a dashed vertical line — is now displayed.
2. To move back to echoes that were displayed within the past few minutes, continue pressing and holding the cursor pad to the left.
The 972 recalls echoes from the last 3000 pings.
As you move the position marker with the cursor pad, the marker speed accelerates to quickly scroll to the desired location.

The lat/lon of the position marker is displayed at the bottom of the picture, along with the time elapsed since the ping, and the distance and bearing from your present position to the marker (assuming the navigator is providing position data).

As you move the position marker left and right, these coordinates change accordingly.

NOTE:

When you use the position marker on a split screen (showing either two frequencies, or zoom mode), each half of the screen has a position marker. Both markers designate the same physical location.

The number of minutes of past echo data available depends on two factors:

- the depth of the water
- the advance speed

In deeper water, the sounder pings at a slower rate, so the echo sounder saves data over a longer period of time. A slower advance speed will have the same effect.

Echo sounding alarms

The echo sounder's alarms work just like all other alarms: they are displayed as a flashing alarm icon on the screen, with details shown on the *Alarms* screen accessed with the **STAR** key. (See *Alarms*, starting on page 132.)

To alert you automatically in situations related to echo sounding, you can set three types of alarms:

- fish alarm
- seabed bottom alarm
- temperature alarm

Setting the fish alarm

When the fish alarm is on, an alarm sounds if an echo returns from either inside or outside specific upper and lower limits you've set.

You can selectively limit the size of the fish you want to be notified about by adjusting the alarm's echo strength level. Using this feature, you'll only be alerted to the presence of fish that meet your minimum size requirements.

You may further narrow your fish alarms to notify you of the presence of fish within (or outside) a certain depth range. Only those fish that are detected inside (or

outside) of that range will trigger the alarm. Green markers are displayed to indicate the range.

When fish are detected, the alert tone sounds and the flashing **FISH** alarm icon is displayed. This message clears automatically after 20 seconds and the alarm is rearmed.

To access the fish alarm settings:

1. At the *Echo Sounder* screen, press **More**.
2. Press **Alarms**.
3. Press **Fish alarm**.

Setting the alarm's echo strength level

To set the fish alarm's minimum echo-strength level:

1. At the *fish alarm* window, press **Level**.
2. Press the cursor pad up or down to set the echo strength level from 1 to 15.

Echoes that are stronger than the selected level will cause an alarm.

Setting the upper and lower marker depths

The fish alarm will sound only when there are echoes inside (or optionally, outside) the upper and lower markers. These markers are displayed on the *Echo Sounder* screen.

To set the markers:

1. Press **Set upper**
2. Press the cursor pad up or down to set the depth, or use the keypad to manually enter the desired depth (press **ENTER** when done).
3. Press **Set lower** and set the depth of the lower marker in the same way.

Now you must tell the 972 whether you wish to be notified of fish detected inside the depth range you've set, or outside that range.

Setting inside or outside fish markers

If you designate the markers as *Inside* markers, the fish alarm sounds when fish are detected within these markers. If you set these markers as *Outside* markers, the fish alarm sounds when fish are detected outside of these markers.

To set the markers to *Inside* or *Outside*, at the *fish alarm* window, press **Markers** to cycle between the two settings.

Turning the fish alarm on and off

To turn the alarm on or off, at the *fish alarm* window, press **Alarms**. Generally, you'll want to turn the alarm on *after* you finish making all the other settings.

Setting the bottom alarm

When the bottom alarm is set, an alarm sounds if the echo sounder detects that the bottom is shallower than the limit you've set. A red marker indicates the limit.

When a shallow bottom is detected, the alert tone sounds and the flashing alarm icon **BOTTOM** is displayed. This message clears automatically after 20 seconds, and the alarm is reset.

To access the bottom alarm:

1. At the *Echo Sounder* screen, press **More**.
2. Press **Alarms**.
3. Press **Bottom alarm**.

Now you can set the depth at which you want to be notified about a shallow bottom.

Setting the bottom level

To set the bottom level, at the *bottom alarm* window, press the cursor pad up or down to set the depth, or use the keypad to manually enter the desired depth (press **ENTER** when done).

NOTE:

The sounder's depth indicator reflects the depth below your vessel's *transducer*, not below the *keel*. Ask your installer for the exact distance between your transducer and your keel. This value must then always be manually added to the sounder's

depth indicator, or entered into the transducer's depth setting on the *Sounder Options* screen for a reading that doesn't need to be corrected.

Turning the bottom alarm on and off

To turn the alarm on or off, at the *bottom alarm* window, press **Alarms**.

Setting the temperature alarm

When the temperature alarm is set, an alarm sounds if the echo sounder detects that the water temperature has either risen above or dropped below the limit you've set. Orange markers indicate the temperature limits.

This alarm isn't present unless a temperature sensor is installed and configured.

When the temperature alarm sounds, the flashing alarm icon **THERM** is displayed. This message clears automatically after 20 seconds and the alarm is reset

To set the temperature alarm:

1. At the *Echo Sounder* screen, press **More**.
2. Press **Alarms**.
3. Press **Temp alarm**.

Setting the upper and lower temperature limits

You can set the upper and lower temperature limits. When the water temperature is

either inside or outside these limits, the temperature alarm will sound.

To set the upper temperature limit:

1. At the *temperature alarm* window, press **Set upper**.
2. Press the cursor pad up or down to set the temperature, or use the keypad to manually enter the desired temperature.

Set the lower temperature limit in the same way, after pressing **Set lower**.

Setting inside or outside temperature limits

If you set the upper and lower temperature limits as *Inside* limits, the temperature alarm sounds when the measured temperature is within these limits. If you set these limits as *Outside* limits, the temperature alarm sounds when the measured temperature is outside of these limits.

Press **Limits** on the *temperature alarm* window to switch between the *Inside* and *Outside* settings.

Turning the temperature alarm on and off

To turn the alarm on or off, at the *temperature alarm* window, press **Alarms**.

Troubleshooting the echo sounder

If there are no echoes displayed when the **SOUNDER** key is pressed, follow this troubleshooting table to determine the cause.

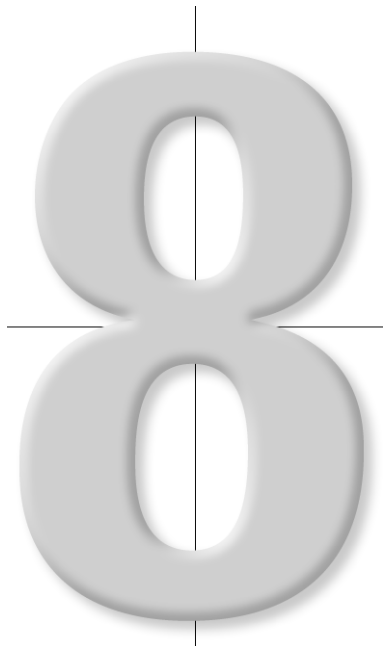
Step	Decision Point	Condition 1	Condition 2
1	Has the AUX port been configured for the 491?	If No, follow the steps in <i>Setting up the echosounder</i> , on page 151.	If Yes, proceed to step 2.
2	Is the Advance Speed set to zero?	If No, proceed to step 3.	If Yes, change the Advance speed setting.
3	Is the 491's LED STAT indicator dark?	If No, proceed to step 4.	If Yes: Check fuses and circuit breakers. Check power to 491 with a voltmeter. Verify data cable is properly wired and connected.
4	Is the LED blinking or steady on?	If Flashing, proceed to step 5.	If Steady On: Check transducer connector for proper wiring. If wiring is correct, check transducer impedance. Replace transducer if open or shorted.
5	Is the LED flashing once per second or four times per second?	If Four times per Second, there is most likely a hardware problem inside the 491.	If Once per Second, the 491 and the 972 are trying to establish communication. Wait two minutes, then check all wiring to the 491 and try again.

Maintaining the transducer

Do not expose a transducer to gasoline or clean it with strong solvents, as either of these can penetrate and degrade the housing. If a transducer will be exposed to salt water, coat it with anti-fouling paint to prevent sea growth. To clean a transducer of sand, debris, or sea growth, use a stiff brush or putty knife. If necessary, wet-sand with finer grade wet or dry paper. Use sanding sparingly, as repeated sanding may affect a transducer's performance at high speeds. Check the transducer periodically.

Additional information can be found on Airmar's website:

www.airmar.com



Reference section 8 **Video**

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Video sources

The Northstar 972 can display video signals from a variety of sources. TV cameras, videotape, and DVD players all can display their images on the 972's screen as long as the signals conform to NTSC or PAL standards.

Just connect the video source's cable to one of the four BNC connectors on the back of the 972 black box, and the signals will be available for display.

Video signals are not carried over the Ethernet network. A separate video cable must be run to each 972 system.

Displaying video

To display a video signal from a connected source, press the **VIDEO** key.

The full-screen video image works just like any other function – press **VIDEO** to display it and press any other function key to switch to another screen.

If no video signal is present, a blue screen is displayed. Press and hold **VIDEO** and turn on a connected video source.

Auto sequencing

The 972 can cycle automatically between the four video inputs. Press **Autocycle** to turn this feature on or off. Choose the time for each input by pressing and holding **VIDEO** to display the *Video Options* screen.

Pausing video

You can pause or freeze the current video image by pressing **Stream** to select *Pause*.

Press **Stream** again to toggle back to *Running* to get back to real time video playback.

Video options

To access the video options, press and hold **VIDEO**.

Aspect mode

You can choose how the image fills the screen:

- **Crop** –cuts off the edges to make the image fill the screen

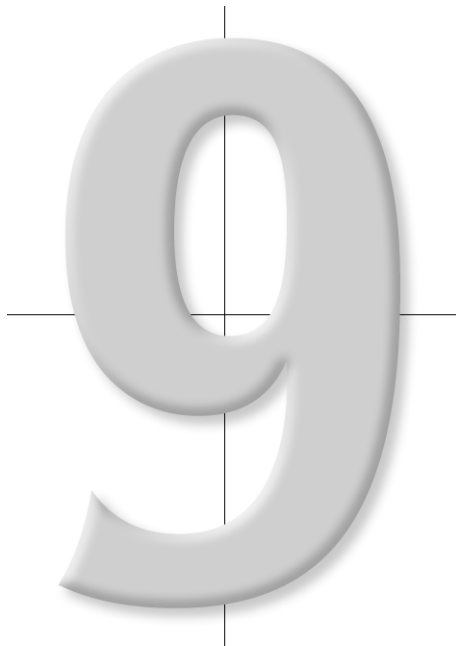
- Stretch – makes the image fill the screen by distorting it slightly
- Restrict – displays the entire image, with side bars filling the edges of the screen.

Autocycle time

Choose the time that each camera will be displayed when Autocycle is turned on: 5 seconds, 10 seconds, 30 seconds, 1 minute, 5 minutes.

Cameras

Camera one through Camera four; *On* or *Off*.



Reference section 9
Alarms and TideTrack

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Alarms

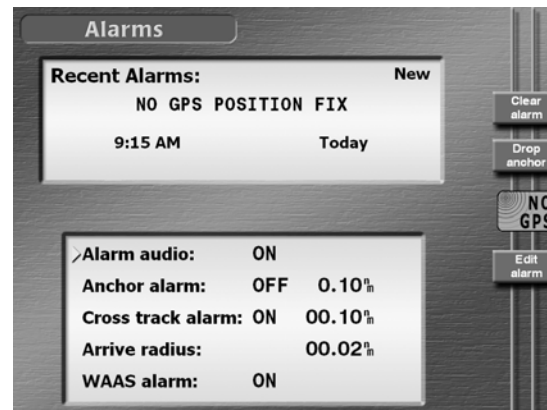
Alarms automatically alert you to certain situations, for example, when you're approaching a waypoint, or entering an avoidance area, or when you've lost position fixes. The 972 displays an alarm in two ways:

- as an alarm icon flashing on the display screen. (For a detailed explanation of these alarm icons, see Table 3 on page 133.)
- as an alarm message on the *Alarms* screen

Also, whenever an alarm icon appears on any screen, an audible alarm will sound if you've turned on the alarm audio. Each alarm has a distinctive beep that's based on Morse code. If you're choosing whether to keep the alarm audio on or off, remember that the audio beep may be a necessity when you're unable to look at the display screen.

Displaying alarm messages

To display more information about current and previous alarms, press the **STAR** key.



Alarm screen, showing “No GPS” alarm

New alarm messages

The word *NEW* in the *Recent Alarms* box tells you that the alarm shown hasn't been acknowledged, or “cleared” yet (see “Clearing alarms” below). There may also be other uncleared alarms that you should acknowledge by clearing.

Recent alarm messages

The 972 keeps a record of the most recent alarm from each main category (such as anchor, avoidance, communications, cross track, GPS signals, and waypoints) enabling you to “browse” through older alarm messages that have not been acknowl-

edged. Each successive press of **Clear alarm** will show you the most recent alarm message from each category.

Clearing alarms

Clearing an alarm means removing the flashing alarm icon as well as the word *new* from the display of that alarm on the *Alarms* screen. To manually clear an alarm (and to see other alarms that may need clearing), press the **Clear alarm** key on the *Alarms* screen.

There are two types of alarms:

- Auto-clearing alarms automatically clear after the alarm condition

disappears, or in some cases, after a short time-out period (typically about 10 seconds). Most alarms are auto-clearing; however, they can also be manually cleared, if desired.

- Alarms that require manual clearing stay on-screen until you clear them on the *alarms* screen. Some serious alarms, such as loss of position fixes, will repeat at intervals.

All of the 972's alarms are described in Table 3 below.

Table 3: 972 alarms




ALARM ICON	ALARM MESSAGE	ACTIVATED WHEN...	CONTROLLED ON ALARM SCREEN?	CLEAR AFTER TIME-OUT?	CLEAR WHEN OK?
	YOUR ANCHOR MAY BE DRAGGING	Vessel has moved outside the radius limit set in the <i>anchor</i> alarm.	YES	No	No
	YOU'VE ARRIVED AT WAYPT: 'NAME'	Vessel has entered the arrive radius of an active waypoint. This alarm is shown only if you're navigating to a single waypoint, or if you've chosen manual waypoint switching.	No	10 seconds	YES
	YOU'VE ENTERED AVOID ZONE	Vessel has entered the warning radius of an avoidance waypoint.	No	No	No

Table 3: 972 alarms (continued)








ALARM ICON	ALARM MESSAGE	ACTIVATED WHEN...	CONTROLLED ON ALARM SCREEN?	CLEARs AFTER TIME-OUT?	CLEARs WHEN OK?
	NOW NAVIGATING TO WAYPT: 'NAME'	Vessel has switched to the next leg of the route.	No	10 seconds	YES
	YOU'RE CLOSE TO WAYPT: 'NAME'	Vessel is within 900 feet of entering the arrive radius of the current waypoint.	No	YES, 10 seconds	YES
	CROSS-TRACK LIMITS EXCEEDED	Vessel has exceeded the off-course limit set in the <i>cross track</i> alarm.	YES	No	YES
	!!DEMO MODE IS ON!!	You've powered-up the unit while already in demo mode, or a networked unit has selected demo mode.	No	No	YES
	NO GPS POSITION FIX	GPS position fix is unavailable and GPS or Phantom Ioran is the chosen position source. This alarm is delayed for three minutes at power-up.	No	No	YES
	GPS COMMUNICATION FAILURE	The GPS receiver may have failed.	No	No	No
	YOU'VE PASSED WAYPT: 'NAME'	Vessel has passed abeam of the active waypoint — without entering the arrive radius. This alarm only appears if there are NO future waypoints, or if waypoint switching is manual.	No	YES, 10 seconds	YES

Table 3: 972 alarms (continued)







ALARM ICON	ALARM MESSAGE	ACTIVATED WHEN...	CONTROLLED ON ALARM SCREEN?	CLEARs AFTER TIME-OUT?	CLEARs WHEN OK?
	LOADING CHARTS	Machine is loading new charts	No	No	YES
	NO NETWORK	A 972 designated as a slave and requiring a master to be present on the network is not receiving networking signals.	No	No	YES
Sounder alarms (shown only if the sounder is enabled)					
	BOTTOM COLLISION!	Echo sounder detects that the seabed is higher than the specific limit you've set.	No	Within 20 seconds after the seabed falls below the alarm zone	YES
	TEMPERATURE ALARM	Water temperature reaches the condition specified.	No		
	FISH ALARM	Echoes are detected within the specified depth range.	No		
Radar alarms (shown only if radar is enabled)					
	RADAR GUARD VIOLATION	Radar echoes are received within the guard zone.	No	No	No
	RADAR DATA NOT AVAILABLE	The 972 hasn't received radar data for several seconds.	No	No	YES

Table 3: 972 alarms (continued)

ALARM ICON	ALARM MESSAGE	ACTIVATED WHEN...	CONTROLLED ON ALARM SCREEN?	CLEARs AFTER TIME-OUT?	CLEARs WHEN OK?
	NO HEADING DATA	The 972 is not receiving data from the heading sensor.	No	No	No

Alarm audio

You can turn the alarm audio on so that the 972 will beep when any alarm occurs, or you can turn the audio off completely so that you'll only see alarm icons and messages displayed on the screen:

1. On the alarm screen, press the cursor pad to select *Alarm Audio*, then press **Edit alarm**.
2. Press the cursor pad to display *OFF* or *ON*, then press **ENTER**.

Anchor alarm

The anchor alarm will signal when your vessel moves a certain distance from the position of your vessel when you pressed the **Drop anchor** key. You can turn the anchor alarm *On* or *off*, and set the distance that you can drift without triggering the alarm. The default setting is 0.20 nautical miles (about 1200 feet). You can set the anchor alarm to as little as 0.01 nm, but be sure to allow for drifting the length of the anchor chain, plus a safety factor to allow for any GPS inaccuracy.

NOTE:

*Remember to press **Raise Anchor** before you intentionally move away from the anchor-drop point.*

To set the anchor alarm:

1. Press **Drop anchor** where you've dropped the anchor. A waypoint named *ANCR* is created at this location.
2. Press **ENTER**.
3. Press the cursor pad to highlight *Anchor Alarm*, then press **Edit alarm**.
4. Press the cursor pad to turn the alarm to *on*.
5. Set the distance your vessel can normally be expected to move on its anchor chain by pressing the cursor pad to the right, and using the keypad to enter the distance. (Remember to add a safety factor to allow for GPS inaccuracy.)
6. Press **ENTER**.

To turn off the anchor alarm and delete the anchor waypoint, press **Raise anchor** on the *Alarms* screen, followed by **ENTER**.

Cross-track alarm

The cross-track alarm will signal if your vessel moves beyond a certain distance from the desired track line. The default setting is 0.10 nautical miles (about 600 feet). You can set the cross track to as little as 0.01 nm (about 60 feet).

To set the cross-track alarm:

1. On the alarm screen, press the cursor pad to highlight *Cross track alarm*, then press **Edit alarm**.
2. Press the cursor pad to turn the alarm to *On*.
3. To set the cross-track distance limit, press the cursor pad right, and use the keypad to enter the distance, then press **ENTER**.

Arrive radius

The arrive radius defines a circle around your current active waypoint. The default setting for the radius is 0.20 nautical miles, or about 1200 feet. You can set the radius

to as little as 0.01 nm (approximately 60 feet).

Either of two alarms may be triggered when the vessel enters the arrive radius:

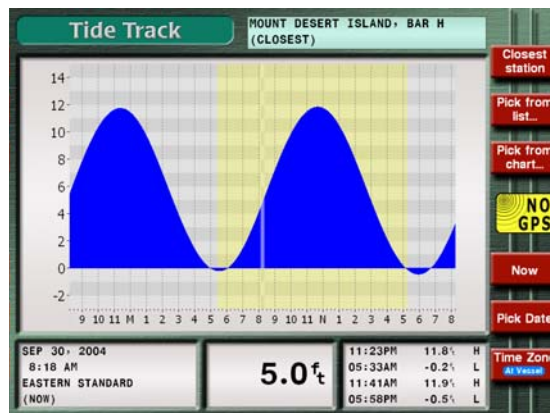
- If you're following a route and have chosen automatic waypoint switching, the 972 displays the *CHANGING* alarm icon and switches to the next leg.
Automatic waypoint switching will also occur if you cross the perpendicular at the end of the current leg.
- If there are no more waypoints in the route, or if you've chosen manual waypoint switching, the ARRIVE alarm is triggered.

To set the arrive radius:

1. On the alarm screen, press the cursor pad to highlight *Arrive radius*, then press **Edit alarm**.
2. To set the distance around waypoints, use the keypad to enter the distance, then press **ENTER**.

TideTrack™

The 972 calculates tide information for any of over 3,540 NOS/NOAA tide stations. To display this information, press the **STAR** key until you see the *Tide Track* screen.



Tide Track screen

The entire U.S. coastline – including Alaska and Hawaii – is covered, plus many Caribbean islands and eastern and western Canada. Data can be displayed only for chart regions that have been activated. Tides can be displayed for any date up to the year 2100. Data is from the official tide-table predictions and should be about as accurate as the printed tables.

The TideTrack screen

The name of the selected NOAA tide station and the selected day are shown at the top of the screen.

A graph of the water height for the selected tide station during any 24-hour period is displayed.

Press the cursor pad left or right to move a horizontal measurement line to any spot on the tide graph. The line is labelled with the exact height that it represents.

Press the cursor pad up or down to advance or go back one day at a time.

Mean Lower Low Water (MLLW) is shown as a solid line near the bottom of the graph. A contrasting vertical line is displayed at the current time.

Just below the tide graph is the time scale, showing the vessel's local time for each point, or (if **Time Zone** has been pressed to select *At Station*) the local time at the tide station.

At the bottom of the screen, the times of high and low tides are listed for that location, along with the tide height at the time indicated by the vertical line.

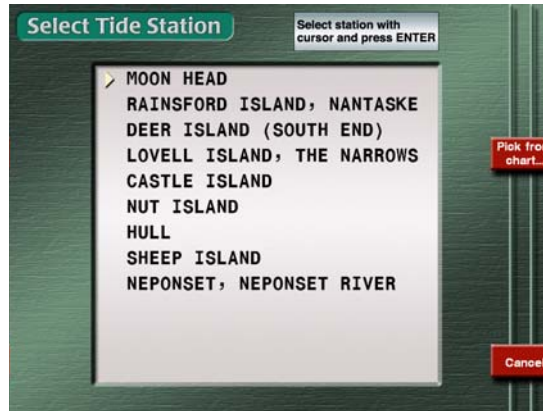
Choosing a nearby tide station

Select the closest tide station by pressing **Closest station**, or choose from any of the nine closest tide stations as follows.

1. On the *Tide Track* screen, press **Pick from list...**

The 972 searches for stations closest to your present position and displays this list with the closest station at the top.

2. Press the cursor pad to select the desired station, then press **ENTER** to display the tides for that station on the *Tide Track* screen.



Tide Station Selection screen

Choosing a tide station from the chart

You can also choose a tide station by moving the cursor to any location along the U.S. coastline.

1. On the **Tide track** screen, press **Pick from chart...**
2. Press the cursor pad to select the general coastline location for which you want tide information, then press **ENTER** to display a list of the nine tide stations closest to this cursor location.

3. Press the cursor pad to select the desired station, then press **ENTER** twice to display the tides for that station on the *Tide Track* screen.

You can also select tide stations directly on the chart, provided tide bars are being displayed.

*To display tide bars, press **CHART** to display the Chart screen. Then press and hold **CHART** to display the Chart Options screen, and press **Vector details**. Then turn on tide bars.*

To choose a tide station, move the cursor over the station and press **Pick station**.

Choosing a specific date

The *Tide Track* screen normally displays tide information for today's date. To display these tides for a different date, you can either press the cursor pad right or left to move the date forward or backwards by one day, or select a new date as follows:

1. Press **Pick date**. The first digit of the current date flashes.
2. Press the cursor pad to move to the month or digit you want to change. To change a digit, press that key on the keypad. To change the month, press the cursor pad up or down.
3. When the date is correct, press **ENTER** to display the tides for the new date.

Currents

Press **STAR** again to display a graph of currents. This screen is very similar to the TideTrack screen. Choose the time, day, or location of a current station in the same way as described above. Currents are displayed as flood (above the base line), ebb (below the base line). Maximums and minimums are shown in the lower right corner.

You may often see discontinuities in the currents graph. These are not errors – they are caused by rotary currents that inherently do not have a smooth transition as the tide goes in and out.

Reference section 10

Networking

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General information

Northstar's networking allow 972's to be connected together to share navigation data. Waypoints and routes are shared among all networked displays, without any work on the user's part. Any changes made to a route or waypoint instantly appear in all connected units. If a unit is turned off while changes are being made, those

changes are automatically copied into that unit when it is turned back on.

Navigation can be started from any unit, and your progress and steering screens are displayed on any unit. In addition, radar and sounder images are sent in real time to all 972 displays on the network, and the radar and the sounder can be controlled from any of the connected units.

Restrictions

In a network, one unit is designated as the master, and all others as slaves. The GPS antenna is connected to the master unit. The only restrictions on networking are the following:

- there must be one and only one master unit operating in a network
- all units must have the same software version.

If, for example, a slave unit is turned on before the master, a message is displayed reminding the user to turn on the master unit before using the slave. In case the master unit is not available (in for service, for example), brief instructions show how to convert a slave into a master unit temporarily.

In normal use, this means that as long as the master is turned on, everything works automatically.

The remainder of this section tells what to do if you experience one of the rare occurrences where networking stops working.

Master unit unavailable

If your master unit becomes unavailable due to a failure or other reason, you can replace it with any other 972 on the vessel.

The GPS antenna and any necessary NMEA devices must be connected to the replacement unit. In many situations, it will be easiest to move the replacement unit to the location of the master and physically replace it.

Configuring the replacement as a master

To function in a network, the replacement unit must be designated as a master unit. To do this:

1. Turn the unit on. When the animated Northstar screen appears, press the **STAR** key.
2. Follow the displayed instructions.

The unit will turn on and operate as a master unit.

After the original master unit is restored, the replacement unit should be set back to slave status.

Any changes made to the database will be lost when the unit is returned to the master setting.

11

Reference section 11 **Setup**

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972 configuration

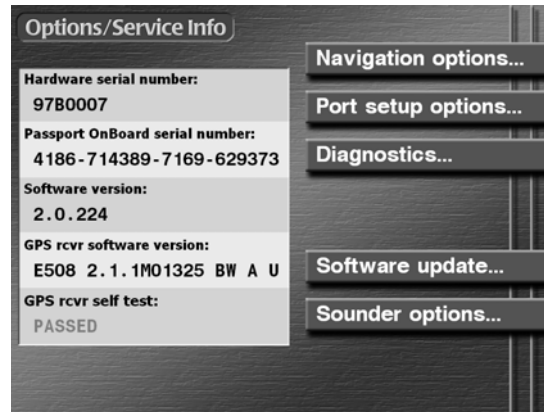
Most of the day-to-day changes you may make to the 972's configuration are made by pressing and holding the function key for the currently displayed function.

NOTE

*You must be on the screen in question before you press and hold that screen's function key. For instance, press **CHART** to display the Chart screen. Then, from there, press and hold **CHART** to get to the Chart Options screen.*

Installation and configuration functions are accessed by pressing the **STAR** key several times to display the *Options / Service Info* screen. These settings are usually adjusted by the system installer or electronics technician.

On the *Options / Service Info* screen, you can also see your unit's serial number, software versions, and receiver self-test results.



Options and Service Info screen

Changing the settings

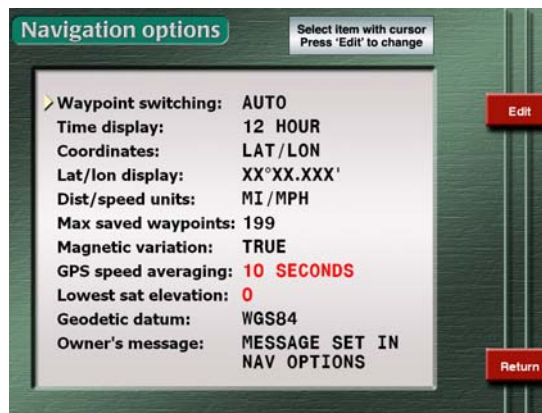
To change any of the options (explained in detail on the following pages), select the option by pressing the cursor pad to move the arrow at the left of the screen, then press **Edit**. The selected option flashes, waiting for you to change it using the cursor pad or the keypad. Once you've made the change, press **ENTER**.

Navigation options

To access the 972's navigation options, press **STAR** until you see the *Options/Service Info* screen.

Press **Navigation options** to access the *Navigation Options* screen.

A number of the options accessible by pressing and holding a function key can also be accessed on the *Navigation Options* screen.



Navigation options screen

Switching waypoints manually or automatically

You can set waypoint switching to:

- automatic – the 972 automatically switches to the next waypoint upon arrival at each waypoint
- manual – you manually switch to the next waypoint

When set to automatic, the 972 displays the new distance and bearing information for the next waypoint when you arrive at the previous one. It immediately stops navigating when you pass a lone waypoint or the last waypoint in a route.

NOTE:

For instructions on changing the waypoint arrival distance, see Arrive radius, on page 137.

You may want to switch waypoints manually if you're maneuvering around a waypoint in search of a lobster trap, or trying to find a buoy in a thick fog. Manual switching lets you keep a continuous display of distance and bearing information for the current waypoint. With manual switching, you must manually change to the next waypoint every time you arrive at the current waypoint:

1. Press **STEER** and then **Navlog...**
2. Select the next leg or waypoint if necessary.
3. Press **Restart** and then **ENTER**.

12- or 24-hour clock

Time of day can be displayed in either a 12- or 24-hour format. This option affects all of the time-related displays, including high and low tides, sunrise/sunset, and ETA.

Coordinates

You can display position coordinates as lat/lon or as Phantom Loran TDs. (See *Using Phantom Loran*, starting on page 49.)

Lat/lon precision

Latitude and longitude can be displayed as either degrees, minutes, and seconds (XX° XX' XX"), or as degrees, minutes, and thousandths of minutes (XX° XX.XXX').

Distance and speed units

Distances and speeds can be displayed in any of the following units of measurement:

- nautical miles, feet, and knots
- kilometers, meters, and kilometers per hour
- statute miles, feet, and miles per hour

The maximum number of saved waypoints

When you save a waypoint by pressing the **SAVE** key, the 972 automatically assigns a sequential waypoint number (such as –S001–) to each point stored. When this number passes the number you set in the *Max saved waypt* option (the factory default setting is 199 saved waypoints), it restarts at the number 1, and overwrites the old saved waypoint previously designated number 1. For many applications, you may want to set this maximum number to a small value, such as five or ten, as long as you promptly rename any saved waypoints you want to save permanently—before they're overwritten.

You can enter a number up to 199 for the maximum number of saved waypoints. For one- or two-digit values, enter zero as the first digit(s).

When being saved to a route, waypoints are automatically assigned four-digit numbers; these waypoints can be overwritten only during a database IMPORT operation.

Choosing magnetic variation

A compass naturally points to the *magnetic* north pole, several hundred miles from the Earth's *geographic* north pole. The differ-

ence between the angles to the two poles is known as *magnetic variation*.

You can display bearings as true (relative to north) or magnetic (to match your compass). The 972 calculates the magnetic variation for your position automatically.

Push the cursor pad up or down to choose:

- true – no variation applied (true bearings are usually required when using a gyrocompass)
- magnetic – the unit calculates variation automatically according to your location and the date

The factory default setting is “automatic.” Under most conditions, you’ll want the 972 to calculate the variation automatically for your position, since the automatically calculated variation is usually entirely adequate.

Choosing the speed averaging time

When you’re using uncorrected GPS, you may see that your Speed-Over-Ground readings are slightly erratic, varying by up to several knots. The 972’s GPS speed averaging function can help steady these readings by lengthening the time over which your speed is averaged, from two to ten seconds. Averaging can also be turned off for the quickest possible reaction time.

Shorter averaging times provide a faster display of speed changes, but with less accuracy. A longer averaging time is useful at lower speeds when you require the steadiest readings and highest accuracy, such as when you want to trawl at a certain optimum speed.

Adjusting satellite elevation

The *lowest sat elevation* option is used mainly for technical applications, in which the 972 must track all visible satellites regardless of how low they are on the horizon. In other instances where high-precision fixes are necessary, you can increase this setting to “hide” any low satellites, thereby preventing their use as sources of GPS position information, and avoiding potential errors.

This option is adjustable from 0° to 25°, in 5° increments, but Northstar recommends leaving this option at the factory setting of 5°.

Choosing a geodetic datum

A variety of lat/lon coordinate models is used by cartographers to produce the world’s navigation charts. Each model is called a datum. The 972’s geodetic datum option contains all referenced datums,

according to Defense Mapping Agency publications.

You should always be sure that the current datum matches the chart being used. In the 972, the datum is generally selected automatically for the chart in use. Most current charts use the WGS84 datum. A few old charts from South America and other areas use other datums. If you choose a datum other than WGS84, an offset will be applied, but only to the GPS lat/lon of your vessel's position. The vessel will be moved on the chart, but not waypoints, routes, or track points.

To change the datum reference:

1. On the *Navigation Options* screen, select the **Geodetic datum** option and press **Edit**.
2. Press the cursor pad up or down to scan through the alphabetic listing.
3. When you see your choice, press **ENTER**.

For a list of the available datums, Appendix A beginning on page 155 in this manual.

NOTE:

You can specify a different datum for the 972's output ports than the one set for the positional display. For instructions on how to do this, see the Northstar 972 Installation Manual (part number GM972IM).

Entering a personalized owner's message

To provide your 972 with a substantial measure of theft protection, you can enter a personalized owner identification message that is displayed every time the unit is turned on. To enter or change this message, you need an access code that Northstar provides when you confirm registration of your system. You can contact customer service by phone or fax with your registration information in order to obtain that code. Once you've received your registered-owner access code, you can enter your owner ID message:

1. From the Display Options menu select the *Owner's Message* option and press **Edit**.
2. Enter the access code from your Northstar owner's card, then press **ENTER**. The first character block of the owner's message flashes.
3. Enter your message using the keypad and cursor pad, then press **ENTER**.

Your message can be changed only by entering your access code number and repeating the above procedure. The 972 gives you three attempts at entering the correct access code; after that, all operations freeze, requiring you to turn power off, then turn it back on again to resume functioning.

Changing your port settings

You can interface the 972 directly to a variety of external equipment, such as autopilots, depth sounders, PC's, and so on. The 972's ports meet the specifications of most navigation devices, providing you with a customized setup for interfacing with practically any NMEA 0183-compatible equipment.

The 972 is interfaced with other equipment through its data transmission ports:

two NMEA ports (labeled **NMEA**), the auxiliary port (labeled **AUX**), and the RS-232 port. To see a summary of the wiring information for these ports, press the **STAR** key to display the *Options/Service Info* screen, then **Port setup options** and **Wiring info**.

For details about interfacing the 972, refer to the 972 Installation Manual (P/N GM972IM) or contact your local authorized Northstar dealer.

Setting up the echosounder

For the echosounder to work with the 972, you must configure the echosounder to the 972's **AUX** port and then set up the **AUX** port for fishfinding:

1. Press the **STAR** key to display the *Options/Service Info* screen.

2. Press **Port setup options**.
3. Press **Edit**.
4. Set the **AUX port** option to "SOUNDER."
5. Press **ENTER**.

To set up the sounder, see the Northstar 491 Installation Manual.

Installing software updates

You can install current software updates by obtaining a software update USB Thumb Drive from Northstar or your local authorized Northstar dealer.

CAUTION!



Do not remove the Thumb Drive or turn the unit off while the update is in progress or your 972 system will be corrupted.

Update all slave units before updating the master unit.

1. Press the **STAR** key to display the *Options/Service info* screen.
2. Press **Software update**.
3. Verify that the proper version number appears in the *Upgrade Search* field on the display.
4. Press **Start Update** and follow any instructions on your screen.

Diagnostics

Network status screen

The Network status screen lists all operating units connected to the network for troubleshooting:

1. On the *Options/Service Info* screen, press **Diagnostics**, then press **Network status**. All units are listed with their model number and serial number. The unit you are currently operating is identified with the text “(me).”

Testing the 972's keypad

A built-in keypad test lets you check the integrity of all the control head's keys.

1. On the *Options/Service Info* screen, press **Diagnostics**, then **Keypad**. Pressing each key identifies it on the screen.

2. When you're done, *press and hold* the cursor pad down until the unit displays the *Options/Service Info* screen again.

Using the LCD test key

From the *Diagnostics* screen, press **LCD test**. This function is used for factory testing of the unit's screen, and it displays several screens controlled by the menu keys. Press any function key to return to another screen.

Storage

Displays the percentage of database storage used and the number of routes and waypoints stored.

Service options

Factory service functions for technician use only.

Changing the time zone

Press the **STAR** key until you see the *Time of Day* screen. The time, date, local time zone, and time of today's sunrise and sunset are shown.



When shipped from the factory, the time zone is set to "GMT" (Greenwich Mean Time).

Note that the day of the week in Greenwich, England may be different from the day in your local time zone.

To change the time zone used for all of the 972 time displays, press **Time zone**, and use the cursor pad to select the desired zone and standard or daylight time. Press **ENTER** to use the new time zone.

Appendix A – Datum list

The following pages list all of the datums available in the 972, together with the mathematical parameters for each.

Datum ID	Datum name	ELLIPSOID	delta x	delta y	delta z
ADI_MN	ADINDAN–Mean–Africa	CL1880	-166	-15	204
ADI_E	ADINDAN–Ethiopia	CL1880	-165	-11	206
ADI_MA	ADINDAN–Mali	CL1880	-123	-20	220
ADI_SE	ADINDAN–Senegal	CL1880	-128	-18	224
ADI_SU	ADINDAN–Sudan	CL1880	-161	-14	205
AFG	AFGOOYE–Somalia	KRASS	-43	-163	45
AIN	AIN EL ABD 1970–Bahrain Island	INTL	-150	-251	-2
ANA	ANNA 1 ASTRO 1965–Cocos Islands	AUSTR	-491	-22	435
ARC50_MN	ARC 1950 mean value	CL1880	-143	-90	-294
ARC50_B	ARC 1950–Botswana	CL1880	-138	-105	-289
ARC50_L	ARC 1950–Lesotho	CL1880	-125	-108	-295
ARC50_M	ARC 1950–Malawi	CL1880	-161	-73	-317
ARC50_S	ARC 1950–Swaziland	CL1880	-134	-105	-295
ARC50_ZR	ARC 1950–Zaire	CL1880	-169	-19	-278
ARC50_ZM	ARC 1950–Zambia	CL1880	-147	-74	-283
ARC50_ZB	ARC 1950–Zimbabwe	CL1880	-142	-96	-293
ARC60_MN	ARC-1960 mean value	CL1880	-160	-8	-300
ARC60_K	ARC 1960–Kenya	CL1880	-161	-7	-300
ARC60_T	ARC 1960–Tanzania	CL1880	-158	-12	-299
ASC	Ascension Island 1958	INTL	-207	107	52
ABE	Astro Beacon “E” (Pacific Isl.)	INTL	145	75	-272
AB4	Astro B4 Sorol Atoll (Hawaiian Islands)	INTL	114	-116	-333
AD714	Astro Dos 71/4 (Atlantic Isl.)	INTL	-320	550	-494
AS52	Astronomic Station 1952	INTL	124	-234	-25
AG66	Australian Geodetic 1966	AUSTR	-133	-48	148
AG84	Australian Geodetic 1984	AUSTR	-134	-48	149
BEL	Bellevue (IGN)	INTL	-127	-769	472
BER	Bermuda 1957	CL1866	-73	213	296
BOG	Bogota Observatory (Colombia)	INTL	307	304	-318
CMI	Campo Inchauspe	INTL	-148	136	90
CA66	Canton Astro 1966	INTL	298	-304	-375
CAPE	Cape (South Africa)	CL1880	-136	-108	-292
CC_MN	Cape Canaveral mean value	CL1866	-2	150	181
CARTH	Carthage	CL1880	-263	6	431
CHAT	Chatham 1971 (S.W. Pac. Isl.)	INTL	175	-38	113
CHUA	Chua-Astro	INTL	-134	229	-29
CORR	Corrego-Allegre	INTL	-206	172	-6
DJAK	Djakarta (Batavia)	B1841	-377	681	-50
DOS68	DOS 1968 (S.W. Pac. Isl.)	INTL	230	-199	-752
EI67	Easter Island 1967	INTL	211	147	111
EUR50_MN	European 1950–mean value	INTL	-87	-98	-121

Datum ID	Datum name	ELLIPSOID	delta x	delta y	delta z
EUR50_WE	European 1950–Western Europe	INTL	-87	-96	-120
EUR50_CY	European 1950–Cyprus	INTL	-104	-101	-140
EUR50_EG	European 1950–Egypt	INTL	-130	-117	-151
EUR50_GB	European 1950–England	INTL	-86	-96	-120
EUR50_GR	European 1950–Greece	INTL	-84	-95	-130
EUR50_IR	European 1950–Iran	INTL	-117	-132	-164
EUR50_SA	European 1950–Sardinia	INTL	-97	-103	-120
EUR50_SI	European 1950–Sicily	INTL	-97	-88	-135
EUR50_NF	European 1950–Norway and Finland	INTL	-87	-95	-120
EUR50_PS	European 1950–Portugal and Spain	INTL	-88	-109	-122
EUR79	European 1979	INTL	-86	-98	-119
GAND	Gandajika Base (Indian Ocean)	INTL	-133	-321	50
GD49	Geodetic Datum 1949	INTL	84	-22	209
GUAM63	Guam 1963	CL1866	-100	-248	259
GUX	Gux 1 Astro	INTL	252	-209	-751
HJOR	Hjorsey 1955–Iceland	INTL	-73	46	-86
HK	Hong Kong 1963	INTL	-156	-271	-189
IND_TV	Indian (Thailand/Vietnam)	EVRST	214	836	303
IND_BIN	Indian (Bangladesh/India/Nepal)	EVRST	289	734	257
IRE65	Ireland 1965	AIRYM	506	-122	611
ISTS	ISTS 073 Astro 1969	INTL	208	-435	-229
JI61	Johnston Island 1961	INTL	191	-77	-204
JAND	Kandawala–Sri Lanka	EVRST	-97	787	86
KERG	Kerguelen Island (Indian Ocean)	INTL	145	-187	103
KERT	Kertau 1948 (Malaysia)	EVRSTM	-11	851	5
KKJ	KKJ (Finnish)	FINN	-78	-231	-97
LC5A	L.C. 5 Astro (Caribbean)	CL1866	42	124	147
LIB64	Liberia 1964	CL1880	-90	40	88
LUZ_P	Luzon–Phillipines	CL1866	-133	-77	-51
LUZ_M	Luzon–Mindanao Island	CL1866	-133	-79	-72
MAHE	Mahe 1971 (Indian Ocean)	CL1880	41	-220	-134
MASI	Marco Astro–Salvage Islands	INTL	-289	-124	60
MASS	Massawa (Africa)	B1841	639	405	60
MERCH	Merchich (Africa)	CL1880	31	146	47
MA61	Midway Astro 1961	INTL	912	-58	1227
MINA	Minna (Africa)	CL1880	-92	-93	122
NAH_O	Nahrwan–Masirah Island (Oman)	CL1880	-247	-148	369
NAH_UA	Nahrwan–United Arab Emirates	CL1880	-249	-156	381
NAH_SA	Nahrwan–Saudi Arabia	CL1880	-231	-196	482
NAP	Naparima BWI (Trinidad and Tobago)	INTL	-2	374	172
NAD27_MN	North American 1927–CONUS mean value	CL1866	-8	160	176
NAD27_WU	North American 1927–Western U.S.	CL1866	-8	159	175
NAD27_EU	North American 1927–Eastern U.S.	CL1866	-9	161	179
NAD27_AK	North American 1927–Alaska	CL1866	-5	135	172

Datum ID	Datum name	ELLIPSOID	delta x	delta y	delta z
NAD27_BH	North American 1927–Bahamas	CL1866	-4	154	178
NAD27_SS	North American 1927–San Salvador Island	CL1866	1	140	165
NAD27_CN	North American 1927–Canada	CL1866	-10	158	187
NAD27_AB	North American 1927–Alberta and B.C.	CL1866	-7	162	188
NAD27_EC	North American 1927–East Canada	CL1866	-22	160	190
NAD27_MO	North American 1927–Manitoba and Ontario	CL1866	-9	157	184
NAD27_NE	North American 1927–N.W. Terrs. & Sask.	CL1866	4	159	188
NAD27_YK	North American 1927–Yukon	CL1866	-7	139	181
NAD27_CZ	North American 1927–Canal Zone	CL1866	0	125	201
NAD27_CR	North American 1927–Caribbean	CL1866	-7	152	178
NAD27_CA	North American 1927–Central America	CL1866	0	125	194
NAD27_CU	North American 1927–Cuba	CL1866	-9	152	178
NAD27_GR	North American 1927–Greenland	CL1866	11	114	195
NAD27_MX	North American 1927–Mexico	CL1866	-12	130	190
NAD83	North American 1983	GRS80	0	0	0
OB1966	Observatorio 1966 (Atl. Isl.)	INTL	-425	-169	81
OEG	Old Egyptian	HELM	-130	110	-13
OHW_MN	Old Hawaiian–mean value	CL1866	61	-285	-181
OHW_HW	Old Hawaiian–Hawaii	CL1866	89	-279	-183
OHW_KA	Old Hawaiian–Kauai	CL1866	45	-290	-172
OHW_MA	Old Hawaiian–Maui	CL1866	65	-290	-190
OHW_OA	Old Hawaiian–Oahu	CL1866	56	-284	-181
OMAN	Oman	CL1880	-346	-1	224
OSGB_MN	Ordin. Survey of Gr. Britain 1936–mean value	AIRY	375	-111	431
OSGB_E	Ordin. Survey of Great Britain 1936 –England	AIRY	371	-112	434
OSGB_IM	Ordin. Survey of G. B. 1936–Isle of Man, Wales	AIRY	371	-111	434
OSGB_SSI	Ord. Surv of G.B. 1936–Scot. & Shetlnd Islands	AIRY	384	-111	425
OSGB_WL	Ordinance Survey of Great Britain 1936–Wales	AIRY	370	-108	434
PDLN	Pico De Las Nieves–Canary Islands	INTL	-307	-92	127
PA67	Pitcairn Astrological–1967	INTL	185	165	42
PSC63	Provisional S. Chilean 1963	INTL	16	196	93
PSA56_MN	Provisional S. American 1956–mean value	INTL	-288	175	-376
PSA56_BO	Provisional S. American 1956–Bolivia	INTL	-270	188	-388
PSA56_NC	Provisional S. American 1956–N. Chile	INTL	-270	183	-390
PSA56_SC	Provisional S. American 1956–S. Chile	INTL	-305	243	-442
PSA56_CO	Provisional S. American 1956–Columbia	INTL	-282	169	-371
PSA56_EC	Provisional S. American 1956–Ecuador	INTL	-278	171	-367
PSA56_GY	Provisional S. American 1956–Guyana	INTL	-298	159	-369
PSA56_PR	Provisional S. American 1956–Peru	INTL	-279	175	-379
PSA56_VN	Provisional S. American 1956–Venezuela	INTL	-295	173	-371
PRICO	Puerto Rico	CL1866	11	72	-101
QUAT	Qatar National	INTL	-128	-283	22
QORN	Qornoq (Greenland)	INTL	164	138	-189
REUN	Reunion (Indian Ocean)	INTL	94	-948	-1262

Datum ID	Datum name	ELLIPSOID	delta x	delta y	delta z
ROME	Rome 1940	INTL	-225	-65	9
SDOS	Santo (DOS) (S.W. Pacific Isl.)	INTL	170	42	84
SBRAZ	Sao Braz (Atl. Isl.)	INTL	-203	141	53
SHILL	Sapper Hill 1943	INTL	-355	16	74
SCHW	Schwarzeck (Namibia)	B1841N	616	97	-251
SA69_MN	South American 1969–mean value	SA1969	-57	1	-41
SA69_AG	South American 1969–Argentina	SA1969	-62	-1	-37
SA69_BO	South American 1969–Bolivia	SA1969	-61	2	-48
SA69_BR	South American 1969–Brazil	SA1969	-60	-2	-41
SA69_CH	South American 1969–Chile	SA1969	-75	-1	-44
SA69_CO	South American 1969–Colombia	SA1969	-44	6	-36
SA69_EC	South American 1969–Ecuador	SA1969	-48	3	-44
SA69_GY	South American 1969–Guyana	SA1969	-53	3	-47
SA69_PA	South American 1969–Paraguay	SA1969	-61	2	-33
SA69_PR	South American 1969–Peru	SA1969	-58	0	-44
SA69_TT	South American 1969–Trinidad and Tobago	SA1969	-45	12	-33
SA69_VZ	South American 1969–Venezuela	SA1969	-45	8	-33
SASIA	South Asia	FS1960M	7	-10	-26
SEBAS	Southeast Base	INTL	-499	-249	314
SWBAS	Southwest Base	INTL	-104	167	-38
TIMB	Timbalai 1948 (Malaysia)	EVRST	-689	691	-46
TOK_MN	Tokyo mean value	B1841	-128	481	664
TOK_JP	Tokyo–Japan	B1841	-123	483	662
TOK_KR	Tokyo–Korea	B1841	-128	481	665
TOK_OK	Tokyo–Okinawa	B1841	-135	478	661
TA68	Tristan Astrological 1968 (S. Atl.)	INTL	-632	438	-609
VL16	Viti Levu 1916 (S.W. Pac. Isl.)	CL1880	51	391	-36
WE60	Wake–Eniwetok 1960	HOUGH	101	52	-39
WGS72	WGS 1972	WGS-72	0	0	4.5
WGS84	WGS 1984	WGS	0	0	0
ZAND	Zanderij (S. America)	INTL	-265	120	-358

Appendix B – Specifications

GENERAL

- Complete system consists of control head and remote processor box
- Course up / north up /leg up
- Split screens

CHARTING

- Jeppesen Marine Passport OnBoard
- Jeppesen Marine Raster charts
- 3-D Bathymetric charts of U.S. waters
- Satellite photos of U.S. waters
- Vector / 3-D overlay
- Shaded relief
- Vector / photo blend
- U.S. street / road data
- Maptech 4.0 or greater BSB NOAA Raster chart compatible
- Scales from 4096nm to 1/8nm
- Displays chart data, vessel, waypoints, routes and tracks
- Built-in worldwide map to 64nm
- Instantaneous panning and zooming

POSITION DATA

- Lat/Lon (158 datums) or Loran TDs
- GPS status screens

STEER SCREENS

- Large, graphical presentation
- Cross-track error (traditional and 3-D)
- Waypoint name, position
- Distance and bearing to waypoint
- Speed / Course-Over-Ground (SOG/COG)
- Estimated Time of Arrival (ETA)
- Estimated Time EnRoute (ETE)
- Automatic magnetic variation

WAYPOINT & ROUTE MANAGEMENT

- Enter waypoints graphically or numerically
- User-entered avoidance waypoints
- Stores up to 1,000 waypoints, 500 routes
- Stores up to 35 waypoints per route
- Edit /erase waypoints or routes graphically
- Plot any route with automatic chart scale selection

WAYPOINT NAVIGATION

- “Point-and-Shoot” navigation

- Navigate to coordinates, waypoints and along routes
- Save current position
- Follow stored routes forward or backward

OTHER FUNCTIONS

- Anchor watch
- Avoidance alarm
- GPS clock
- Tidetrack™ tide information
- Current information with chart overlay

INTERFACING

- Networkable with other 972 units
- Two bi-directional NMEA I/O ports, 1 aux port
- One bi-directional RS-232 port
- Waypoint upload/download capability from a PC
- NMEA output sentences: APB, BOD, BWC, GGA, GLC, GLL, GSA, GSV, LCD, HSC, MSS, RNN, RMC, RMA, RMB, VTG, WCV, XTE, ZDA, ZTG (Conforms to NMEA v 2.0 and later. Supports 1.5 GLL and BWC.)
- NTSC Video in/VGA out (640 x 480)
- NMEA input sentences: WPL, TLL and others
- 200 PPNM speed output or ext. alarm output

972 PHYSICAL

FEATURES/ENVIRONMENTAL

- Waterproof enclosure
- 15" diagonal color TFT LCD
- Complementary design to the Northstar 6000i series and 1502
- 972 panel resolution 1024 x 768 (XGA)
- 10-36 VDC 36 Watts power
- Operating temperature 0°C to 55°C max
- 95% relative humidity, non-condensing
- Storage temperature -20°C to 80°C
- Flush mount only– IPX6 rating from front; IPX2 rating from rear
- WAAS SPECIFICATIONS
- Integrated 12-channel L1 GPS/WAAS Pod antenna-receiver
- 2- channel WAAS reception
- WAAS accuracy < 2 meters 2dRMS
- 50' antenna cable standard

OPTIONS

- Compatible with Northstar Ethernet Radars 4-25kW
- Compatible with Northstar 491 Fishfinder
- 2-Year Limited Warranty

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